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JOURNAL
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(THE) FRANKLIN INSTITUTE,
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OF THE
State of Pennsylvania,

FOR THE
PROMOTION OF THE MECHANIC ARTS.

DEVOTED TO
MECHANICAL AND PHYSICAL SCIENCE, CIVIL ENGINEERING, THE ARTS
AND MANUFACTURES, AND THE RECORDING OF AMERICAN
AND OTHER PATENTED INVENTIONS.

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JOURNAL

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OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

JANUARY, 1850.

CIVIL ENGINEERING.

Experiments on Paddle Wheels for Steamers. By MR. GEO. RENNIE.*

I have read with much interest, in the Journal for July and August last, an account of a series of "Experiments on the Figure, Dip, Thickness, Material, and Number of the Paddles of Steamers, by Thomas Ewbank, Esq., of the City of New York, in the years 1845 and 1848," extracted from the Journal of the Franklin Institute. As Mr. Ewbank has devoted much time to these pursuits, and is the author of a valuable work on Hydraulic Machinery, his observations are entitled to attention.

The facts developed by his experiments may be briefly stated; they are as follows:—

1st, That, with equal areas and equal dip, triangular blades may be rendered twice as effective as ordinary rectangular ones; and this, too, while the propelling surface of the smaller number of floats was only half that of the greater.

2d, That, as the propelling power of a paddle is greatest at its greater or outer extremity, and diminishes to nothing at the surface, so its face should enlarge with the dip, and be nothing above—in imitation of the tails of fishes, the wings of birds, &c.

3d, That the fewer the number of paddles on a wheel the better, provided *one* be always kept in full play; and,

4th, That it would be more advantageous to point or fork them as proposed, to evade the jar of their striking the surface.

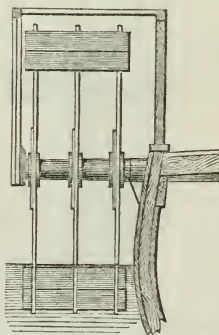


Fig. 1.—Ordinary System.

* From the London Civil Engineer and Architect's Journal, for September, 1849.

Mr. Ewbank concludes his paper by referring to the experiments made by me on H. M. steamer "African," in 1841, but which he had not been able to find, although similar experiments on two other vessels were published in your Journal for January, 1840, and subsequently in the Nautical Magazine for 1841. As the subject is now more interesting, I no longer hesitate to communicate the results.

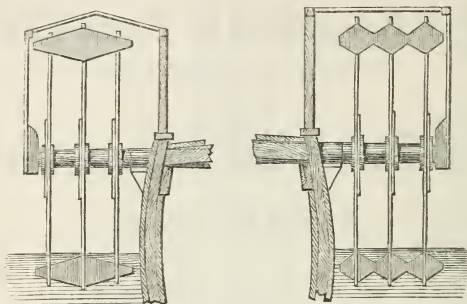


Fig. 2.—Modifications of Ordinary System.

In the year 1831,* my attention was attracted to this subject during the investigations undertaken for the purpose of ascertaining the laws of the friction and resistances of solids in motion in fluids, such as air and water; when, on causing disks or plates of metal to rotate round a fixed axle, by means of weights descending through given spaces and times, it was found

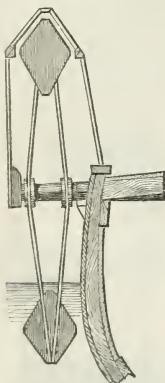


Fig. 3.
Improved Trapezium System.

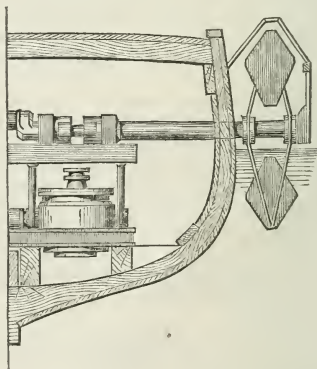


Fig. 4.—Improved Trapezium System.
With wheels of smaller diameter and greater velocity.

that, when a certain portion (one-fourth) of a rectangular disk or fan was intercepted from the interior part of the rectangle, so as to approximate to the form of a duck's foot, the resistance, whether through air or water, was

* See Philosophical Transactions for 1831.

the same—or, in other words, the resistance with *three triangular* or duck-footed floats was as great as previously with four rectangular floats. This apparent paradox was, however, accounted for on the principle of the interior or detrimental portion of the rectangular float being removed.

A series of experiments on two other vessels was again made in the years 1839, 1840, and 1841, by applying different shaped floats to paddle wheels of different diameters and widths, and on steam vessels of different powers of from 6 to 90 horses, an abstract of some of which was published in your Journal for 1840.

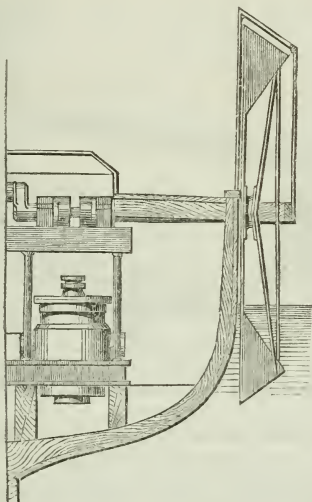


Fig. 5.—Improved Triangular System when the Vessel is Upright.

The following were the particulars of the “African” when tried in 1837, previous to her being tried in 1841:—

	Feet.	Inches.
Length between perpendiculars,	109	11
Extreme breadth,	24	10
Mean draught,	9	4½
Depth,	10	0

Nominal power of engines (by Maudslays and Field) 45 horses, or 90 horses together.

Number of strokes made by the engine per minute, 29 to 30.

Barometer gauge, 24 to 26¾ inches.

Area of immersed midship section, 150 square feet.

Mean diameter of the paddle wheels, 14·7.

Area of the immersed rectangular floats, on the cycloidal or Galloway system, twelve in number, 7 feet in length, and 1 foot 9 inches in breadth; thus presenting an area of from 57 to 60 square feet, being a ratio of 1 foot of float to 2·6 midship section.

When this trial was made in 1837, at the measured mile in Long Reach, her average speed of six trials each way was 9.174 statute miles per hour with her rectangular floats. Subsequently, she was employed for towing and other purposes, and had never undergone any other repairs than in her engines, and had never been in dry dock; her bottom was consequently foul and covered with green weeds, when tried with the trapezium floats in 1841.

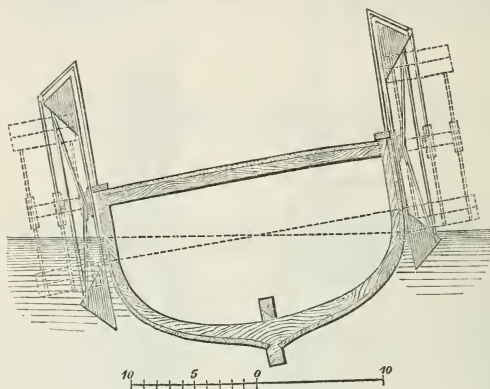


Fig. 6.—Improved Triangular System when the Vessel is Inclined.

Experiments on H. M. Steamer "African," with Trapezium Floats.

First Trial, April 14, 1841.

All the rectangular floats, twelve in number on each wheel, were removed, and twelve trapezium floats were fixed to the interior and middle rings of each wheel:

Thus making the area of the immersed floats 34 square feet.

Number of revolutions made by engines, $23\frac{1}{2}$ per minute.

Mean speed of vessel in statute miles, 9.1.

Mean diameter of wheels, 17 feet.

Second Trial, April 21, 1841.

Number of revolutions made by engines per minute, 23.

Speed in statute miles per hour, (weather very windy,) $8\frac{3}{4}$.

Third Trial—Area of Floats reduced 1 foot each, and reefed-up 4 inches.

Number of revolutions made by engines per minute, $25\frac{1}{2}$.

Speed of vessel in statute miles per hour, 9.022.

Fourth Trial, June 8, 1841.

Number of revolutions made by engines per minute, 25.

Speed of vessel in miles per hour, (weather windy,) 8.8.

Fifth Trial, June 9, 1841.—Immersed Float Surface reduced to 22 sq. ft. area, and reefed-up 11 inches; or reducing the diameter of the wheel 22 inches.

Number of revolutions made by engines per minute, $27\frac{1}{4}$.

Speed of vessel in statute miles per hour, 9.124.

The barometer stood at from 25 to 26 inches.

Which result was nearly equal to her former speed (viz. 9.174) in 1837, with rectangular floats of more than double the immersed area of the trapezium floats.

Experiments with Towing, as per accompanying Table.

In June, 1841, the “African” towed the “Numa” transport of 323 tons, at the rate of $5\frac{1}{2}$ statute miles per hour.

In July following, she towed H. M. steam frigate “Dee,” of 704 tons, and 200-horse power, 5 statute miles per hour,—which was only 1.6 miles per hour less than her greatest speed when propelled by her own engines, or 6.6 miles per hour.

The official report, on the following page, only differs by half a mile between the towing powers of the “African,” with her rectangular floats, in 1837, and the trapezium floats, in 1841; so that, considering that the area of the trapezium floats was merely adapted to propelling the “African” simply as regarded speed, these trials could hardly be taken as the criterion of their powers as applied to towing, when the areas should have been increased expressly for that purpose. But, comparing the whole of the experiments, when tried in still water under the most favorable circumstances, and when tried in the “African,” under the unfavorable circumstances of foul bottom and difference of the powers of the engines, the conclusion is in favor of the trapezium floats. The truth of the principle is confirmed by Mr. Ewbank, and by the laws which govern the forms of the tails of fishes, the feet of aquatic birds, and the wings of birds and insects, whereby the means are so admirably suited to the ends; and the triangular form proposed by Mr. Ewbank for paddle floats entirely confirms the view I took of the subject in the years 1839 and 1840.

London, August 15, 1849.

"African," Steam-Tug; Trials of her Towing Qualities with Mr. Rennie's Trapezium Wheels.

(Tonnage, 323 tons new measurement. Power, 2×45 horse engines = 90 horses' power.)

FIRST EXPERIMENT.—Towed the "Numa" Transport from Deptford to Greenwich.

Date.	No. of Experiment.	Draft of water of Tug.	Dip.	Draft of vessel Towed.	Where tried.	Duration of Experiment.	Distance run.	Rate per hour.	Revolutions.	Remarks.
June 24	1	$\left\{ \begin{array}{l} \text{F. 9 0} \\ \text{A. 9 10} \end{array} \right\}$	$\left\{ \begin{array}{l} \text{ft. in.} \\ 3 \quad 0 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{ft. in.} \\ \text{F. 12 8} \\ \text{A. 14 1} \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Woolwich} \\ \text{to} \\ \text{Deptford.} \\ \text{Blackwall} \\ \text{to} \\ \text{Woolwich.} \\ \text{Barking} \\ \text{to} \\ \text{Gravesend.} \\ \text{Gravesend} \\ \text{to} \\ \text{Woolwich.} \end{array} \right\}$	$\left\{ \begin{array}{l} \text{h. m.} \\ 0 \quad 34 \\ 0 \quad 23 \\ 1 \quad 50 \\ 1 \quad 6 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Knots.} \\ 4 \quad 1\text{--}5 \\ 1 \quad 5\text{--}6 \\ 7\frac{1}{2} \\ 8 \end{array} \right\}$	$\left\{ \begin{array}{l} 7\text{--}4 \\ 4\text{--}8 \\ 4\text{--}09 \\ 7\text{--}3 \end{array} \right\}$	$\left\{ \begin{array}{l} 27\frac{1}{2} \\ 24 \\ 19 \text{ to } 23 \\ 27 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Without the Tow; two patent} \\ \text{logs used.} \\ \text{The 'Numa' in Tow; light wind} \\ \text{ahead.} \\ \text{Pretty fresh breeze ahead in some} \\ \text{of the reaches, which accounts} \\ \text{for the difference of speed of en-} \\ \text{gines.} \\ \text{But little wind; returning with-} \\ \text{out Tow.} \end{array} \right\}$

SECOND EXPERIMENT.—Towed the "Dee" Steam Frigate from Woolwich to Sheerness.

Date.	No. of Experiment.	Draft of water of Tug.	Dip.	Draft of vessel towed.	Where tried.	Duration of Experiment.	Distance run.	Rate per hour.	Revolutions.	Remarks.
July 7	1	$\left\{ \begin{array}{l} \text{F. 8 } 9\frac{1}{2} \\ \text{A. 9 } 9 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{ft. in.} \\ 2 \quad 10 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{ft. in.} \\ \text{F. 8 } 9 \\ \text{A. 8 } 0 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Barking} \\ \text{to} \\ \text{Sea Reach.} \\ \text{Sea Reach} \\ \text{to the} \\ \text{Nore; with} \\ \text{2d motion.} \\ \text{Lower part of} \\ \text{Sea Reach} \\ \text{to} \\ \text{Barking.} \end{array} \right\}$	$\left\{ \begin{array}{l} \text{h. m.} \\ 2 \quad 25 \\ 2 \quad 0 \\ 3 \quad 15 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Knots.} \\ 11\text{--}3 \\ 8\text{--}55 \\ 22\text{--}1 \end{array} \right\}$	$\left\{ \begin{array}{l} 4\text{--}4 \\ 4\text{--}42 \\ 6\text{--}8 \end{array} \right\}$	$\left\{ \begin{array}{l} 23 \text{ to } 24 \\ 34 \text{ to } 38 \\ 27\frac{1}{2} \text{ to } 28 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{Wind W. S. W.; 'Dee' in tow;} \\ \text{moderate breeze.} \\ \text{Strong breeze right aft, which as-} \\ \text{sisted the tow materially; steam} \\ \text{difficult to keep up at 38 revolu-} \\ \text{tions; throttle valves half open;} \\ \text{2d motion in gear.} \\ \text{Fresh breeze ahead and on the} \\ \text{bow throughout the run; 2d mo-} \\ \text{tion not in gear.} \end{array} \right\}$

WOOLWICH YARD, July 9, 1841.

Deflexion of Railway Bridges under the Passage of Heavy Bodies. By
PROFESSOR WILLIS.*

Some time ago a commission, of which Prof. W. had the honor to be a member, was appointed by the Government to inquire into the application of iron to railways; and though he was not about to detail to them all the labors of that commission, he would give them some account of the results of a portion of its researches.

They had found it necessary to ascertain the effect which the passage of loads over iron railway bridges had in deflecting them. They had clearly ascertained the character of the effect a railway engine and tender would have upon an iron bridge when in a state of rest, but they did not know whether, when the train was in a state of motion, the deflexion would be greater or less. For the purpose of determining this interesting and important question, a temporary railroad, the bridge being represented by two iron bars, had been constructed in Portsmouth Dockyard, and so arranged that, by means of an inclined plane, any required degree of velocity could be attained by the carriage with which the experiments were conducted. With this apparatus a long and interesting series of experiments were made, the weight of the loads being varied, and the uniform result was that the statical deflexion (*i. e.* the deflexion caused by the carriage when at rest on the centre of the bars) was three or four times less than the deflexion caused when the carriage was in a state of motion. The apparatus which he exhibited to them that evening was on a much smaller scale than the Portsmouth one, for whilst the latter enabled them to pass a weight of from three to four tons over the bridge, the former only carried a weight of as many pounds.

As the object of the experimental philosopher was to eliminate all obstructing causes, they must begin their experiments on a small scale, so that it was necessary to employ a smaller apparatus, and also to obtain a different material to cast iron, and a material, too, that would give, by its greater delicacy of texture, closer results, and that would not display the curious phenomenon of "set." He had, therefore, in his more recent experiments, used bars of cast steel, and in order to do away with any irregular pressure of the carriage—for in the deflexion they sometimes found more pressure on the one bar than the other—he had used one bar instead of two.

The reverend professor here proceeded to give a description of the apparatus, which consisted of a railway, between twenty and thirty feet long, formed of deal planking, and having at one end an inclined plane with an altitude of about twenty feet. Upon this plane a movable break was fixed, so as to hold the carriage at any required height, and to insure accuracy in the starting point. The centre of the line of rail was occupied by the bridge, and the extreme end opposite the incline was so made as to open slightly outwards, so that springs fixed on either side the carriage might clasp the sides of the line and retard further motion, thus preventing the carriage from running off the line after passing the bridge. The carriage employed was merely a small model of a luggage wagon, the flanches

* From the London Mechanics' Magazine, for September, 1849.

of the wheels being made outwards instead of inwards, so as to clip the line along which they passed.

A long and interesting series of experiments was here performed, the velocity of the motion being considerably varied, the result invariably being that the deflexion of the bar was, during the motion of the carriage, triple the extent of the deflexion caused whilst the carriage merely rested upon the bar.

Mr. Willis now proceeded to observe that the weight of railway bridges was generally much greater than that of any load that passed over them, whilst his bar was much lighter than the load that had so greatly deflected it. An ingenious contrivance for strengthening the bar, by increasing the weight to be deflected with it, was then resorted to, which showed that the increase in the weight of the bridge had diminished the deflexion, although, the Professor observed, that to take this as a general principle would be wrong, for there were cases in which an increase in the weight of the bridge actually increased rather than diminished the deflexion. He was, however, happy to say that the very serious facts connected with the deflexion of iron railway bridges, the results of which he had that evening attempted to develope, did not exist in practice to so great an extent as in theory; and, indeed, they found that the deflexion was, in practice, so slight that it might be almost altogether neglected. This fact the Commission had established by actual experiments upon a bridge on a railway in Surrey.

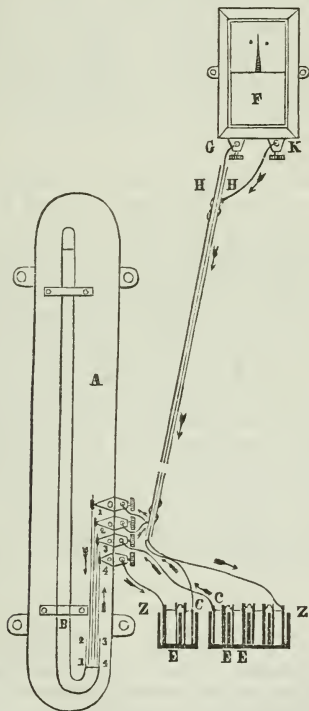
In conclusion, he might observe that some experiments had been made at Portsmouth, as to the advantage to be derived from curving bars upwards, which certainly diminished the centrifugal force, and consequently lessened the deflexion, but no practical results were elicited.

Preventing Explosions in Coal Mines. By MR. GEO. LITTLE.*

I lose not a moment in forwarding you a sketch of my apparatus for the prevention of explosions in mines, in order that those who are disposed may prove its efficacy. A, the ordinary barometer, which may be encased in an iron tube or box; 1, 2, 3, and 4, four adjustable platina wires, in connexion with four binding screws, and leading down into the glass tube, the wires 1 and 4 being the longest; E and EE, a small and large constant battery; F, the galvanometer; G, the insulated conducting wire; its leaden coating, H H. The action of the apparatus will be as follows:—On the sudden fall of the mercury in the tube, which happens when an accumulation of fire-damp is taking place, the mercury at B will rise and make contact between the wires 1 and 4, which will cause the electric current of the small battery to be brought into action, by the electricity passing from the copper, in the direction of the arrow, up through the wire W; thence onwards to the binding screw and wire G, returning by the binding screw 1, onwards, by the platina wire, through the mercury and the wire 4, to the zinc end, thereby completing the circuit, and holding over the indicator to the right, thus giving notice that the gas is accumulating.

* From the London Mining Journal, No. 734.

Now, as the gas accumulates, the barometer will continue to fall, and, consequently, the mercury at B will rise still higher, until it comes into contact with the wires 2 and 3, when the larger battery will be immediately brought into action by the current passing from the copper, in the direction of the arrows, to the binding screw 3; thence by the wire and mercury to the wire and binding screw 2, and onwards by the leaden tube to the



binding screw K, returning through the wire G W; enters in the direction of the arrow to the zinc, completing the circuit in an opposite direction, and, overcoming the power of the small battery E, causes the indicator to pass over to the left, thereby giving notice of extreme danger. An alarm can be placed in the circuit if desirable, so as to obviate the necessity of watching. It is well known that a constant battery can be made to last eighteen months or two years without any attention. The cost of renewing the battery power once every two years will be about 12s. 6d.

Melton-crescent, Euston-square, Sept. 12, 1849.

*Iron Roofing. By MR. R. TURNER.**

At the Liverpool Polytechnic Society, Mr. R. Turner, of Dublin, furnished the following interesting particulars of a new galvanized iron roofing and other works of a railway station at Liverpool, which he is now constructing. The roof covers an area of 6140 square yards, being about 360 feet in length, and 153 feet 6 inches in width. There are no intermediate columns, but this great space is spanned over by one stupendous arch, rising in a segment of a circle to a central height of 30 feet from the spring or cord. The roof consists of 17 curved girders of wrought iron, resting at one side on the walls of the offices, and at the other upon cast iron columns of the Doric order, connected by ornamental arches in perforated iron. These girders are trussed vertically by a series of radiating struts, acted upon by tie-bars, connected with the extremities of the girders; and they are trussed horizontally by a series of purlins and diagonal rods, thus forming one rigid piece of framing from end to end. Upon this framing will be laid plates of galvanized corrugated iron, and three ranges of plate glass, in sheets about 12 feet 6 inches in length, and of great thickness, extending the whole length of the roof. In consequence of the great extent of surface exposed to the variations of temperature, provision has been made for expansion and contraction of the iron without injury to its bearings. The roof, when finished, will weigh about 700 tons. The whole of the work, with the exception of the cast iron columns and ornamental arches, is of wrought iron. The iron columns upon which the roof rests, on the south side of the yard, are 2 feet 3 inches in diameter at their bases. Six of the girders are fixed; and having struck the centres under three of these girders, it was found that in not one of them was there the least perceptible deflexion. Mr. Turner produced specimens of the various parts of the ironwork employed in the roof in question, and explained the manner in which they were applied, so as to make a perfect whole. Though these samples are very massive, it was stated that the huge roof though of great strength, would appear to the eye as light as a cobweb.

Use of Small Engines on Railways.†

The traffic of branch lines in general, if not, too, of some main ones, it would appear, may ere long be altogether conducted by light engines, at great saving of expense. Experiments have occasionally been recorded in the Builder that seemed to promise fairly for such a result, which further experience only appears to confirm. The Railway Times of 13th October, gives the particulars of a personal examination of the doings and dimensions of one of these little, active, and even singularly powerful agents, built by Messrs. England & Co., of the Hatcham Ironworks, and at present at work on the Bow branch of the Blackwall line. It whirls a train of seven of the heavy Blackwall carriages, equal, it is said, to ten of the carriages in general use on other railways, up an incline of 1 in 100, at a

* From the London Mining Journal, No. 734.

† From the London Builder, No. 350.

speed of 35 miles an hour, starting as freely, and getting into speed as readily, as any other engine. The dimensions of this "*Pigmy Giant*," as it is named, are as follows: Cylinders, 8 inches diameter; stroke, 12 inches; driving wheels, 4 feet 6 inches; four carrying wheels, 3 feet diameter; 80 tubes, 1½ inches diameter, 11 feet 4 inches long. The engine and tender are constructed on the same frame, with six wheels, and she is capable of carrying coke and water in her tender sufficient for a journey of 30 or 40 miles. The consumption of coke is less than 5 lbs. a mile, producing, nevertheless, an immense quantity of steam. The weight of the whole engine, when in full working order, is about 10 tons. The centre of gravity being very low, there is no oscillation, even at a very high velocity. The day's work on the Bow branch is a run of about 200 miles.

Report on the Oxidation of Rails in and out of use, Determining the Loss by Abrasion. By MR. R. MALLET.*

The conclusions at which Mr. Mallet has arrived are the following: The top surface of a railway bar in use is constantly preserved in a state of perfect cleanliness, freedom from oxidation and polish; while the remainder of the bar is rough-coated originally with black oxide, and soon after with red rust (peroxide and basic salts). Not only is every metal electro-positive to its own oxides, but, as established in the second Report on the action of air and water on iron, the polished portion of a mass of metal partially polished and partially rough is primarily corroded on the rough portion. Hence a railway bar, while in use, is constantly preserved from rusting by the presence of its polished top surface. Such polished surface has no existence on the rail out of use. The upper surface of the rail in use is rapidly condensed and hardened by the rolling of the traffic over it; and it is also shown in the above Report that, all other circumstances being the same, the rate of corrosion of any iron depends upon its density, and is less in proportion as this is rendered greater by mechanical means. As every metal is positive to its own oxides, the adherent coat of rust upon iron, while it remains, powerfully promotes the corrosion of the metal beneath, and this in a greater degree in proportion as the rust adherent is of greater antiquity.

It has been shown that the rust produced by air and water, which at first contains but little per-oxide, continues to change slowly, and, becoming more and more per-oxidized, becomes more and more electro-negative to its own base. Now, the rust upon a railway bar out of use continues always to adhere to it, and thus to promote and accelerate its corrosion; while the rust formed upon a railway bar in use is perpetually shaken off by vibration, and thus this source of increased chemical action is removed.

To recapitulate, railway bars forming part of a long line, whether in or out of use, corrode less for equal surfaces than a short piece of the same iron similarly exposed. Rails in use do corrode less than those out of use. This difference is constantly decreasing with the lapse of time. The absolute amount of corrosion is a source of destruction of the rail greatly inferior to that due to traffic. It is highly probable that the electrical and

* From the London Athenæum, for September, 1849.

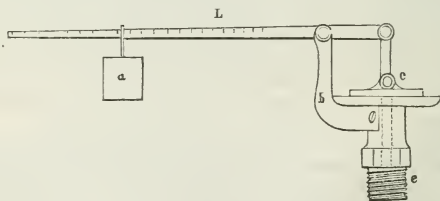
magnetic forces developed in the rails by terrestrial magnetism, and by rolling traffic, react in some way upon the chemical forces concerned in their corrosion; and that, therefore, the direction of lines of railway in azimuth is not wholly indifferent as respects the question of the durability of rails.

The author concludes with two practical suggestions, deducible from the information obtained:—1st, Of whatever quality iron rails are rolled, that they should be subjected, prior to use, to an uniform course of hammer-hardening all over the top surface and sides of the rails; and, 2dly, that all railway bars, before being laid down, should, after having been gauged and strengthened, be heated to about 400° Fahrenheit, and then coated with boiled coal tar. This has been proved to last more than four years, as a coating perfectly impervious to corrosive action, while constantly exposed to traffic.

An Improved Pressure Indicator. By MR. JOHN P. FRASER.*

As many engineers have been much annoyed by the uncertain action of their pressure indicators, (manometers and piston indicators,) the first requiring a correction for the temperature of the air, and the last from friction and unequal expansion, I take the liberty of sending a sketch of one that I have constructed, which, as far as I have used it, seems to answer the purpose well.

Clement Désormes showed that, when steam under high pressure escapes through a pin hole in a plate, and a flat disk is brought close to this plate, the plate and disk are made to adhere. This, then, is the principle on which I have made my pressure indicator. The cause of this I need not here explain, as your readers, if you be kind enough to insert this communication in your valuable Magazine, will, I think, easily understand it.



Description.

a is a weight, which, by sliding outwards or inwards on the arm of *L*, (a lever of the first order, supported by the prop *b*,) an equilibrium may be obtained, and the index then read.

c is a movable disk, linked to the end of the lever *L*; *d* is a plate, having a hole through it and the screwed part, *e*, which is made to fit the top of a gauge glass attached to any convenient part of a boiler or steam chest.

When steam is allowed to rush through the hole in the plate *d*, the reaction produced by the pressure of the atmosphere causes the disk *c* to

* From the London Mechanics' Magazine, for October, 1849.

adhere to the plate. The relative sizes of the disk *c*, and the hole in the plate *d*, together with the weight required to separate the two (that is, the disk and plate) when the steam is allowed to act upon the instrument, determine the amount of pressure sustained by the boiler.

Drawing Office, Swindon Works, Oct. 8, 1849.

*Fastness of Railway Works.**

The great Pyramid of Egypt was, according to Diodorus Siculus, constructed by 300,000—according to Herodotus, by 100,000 men; it required for its execution twenty years, and the labor expended on it has been estimated as equivalent to lifting 15,733,000,000 (fifteen thousand seven hundred and thirty-three millions) of cubic feet of stone, one foot high. Now, in the same measure, if the labor expended in constructing the southern division only of the present London and North Western Railway, be reduced to one common denomination, the result is 25,000,000,000 (twenty-five thousand millions) of cubic feet of similar material lifted to the same height, being 9,267,000,000 (nine thousand two hundred and sixty-seven millions) of cubic feet *more* than was lifted for the Pyramids, and yet the English work was performed by about 20,000 men only, in less than five years.—*Sir F. Head.*

AMERICAN PATENTS.

List of American Patents which issued in the Month of May, 1849, with Exemplifications by CHARLES M. KELLER, late Chief Examiner in the U. S. Patent Office.

1. For a *Locomotive with the Driving Axle above the Boiler*; Richard H. Emerson, Portland, Cumberland county, Maine, May 1.

The patentee says,—“My improvement consists in the manner in which the axle of the driving wheels, the boiler, and the bearing and running truck frames, and their wheels, are disposed or arranged with respect to each other.”

Claim.—“What I claim, is the above described mode of arranging the boiler, the axle of the driving wheels, and truck frames of the supporting wheels, whereby I am enabled to produce an engine combining great speed and safety.”

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2. For an *Improvement in Tables for Ships' Cabins*; William N. Boggs, Southborough, Worcester county, Massachusetts, May 1.

The patentee says,—“My improved table is intended especially for the use of sea-going vessels, the particular object of my invention being to always preserve the top surface of the table horizontal in a transverse direction, during the motions of the vessel produced by the sea or otherwise.”

* From the London Builder, No. 352.

Claim.—“The principal feature of my invention, and that claimed by me, is the above described peculiar arrangement of, or manner of arranging, the hinges or rocking or turning bearings of the table top, together with that of applying the pendulum apparatus, by which the level of the top board is preserved under the transverse motions of the vessel; the said arrangement consisting, first, in placing the hinges or turning bearings nearer to that edge of a table at which a person is to sit than to the opposite edge, as shown in the drawings. Second, In applying the pendulum apparatus to the opposite side or part of the table, as described, whereby it is caused, when the pendulum is vibrated, to act against, or raise and depress, and give greater motion to, that side or part of the table top which is opposite to that at which the person sits; the effect of said arrangement, when a vessel is in the act of rolling, being not only to render the table free from inconvenient action where a person sits to it, but to impart to it stability under weight or pressure applied to it near the edge at which the person so sits or is placed. And I also claim the above described mode of making a table, viz., a combination of two top boards, B B', a supporting frame, and one or more sets of pendulum apparatus, whether made and applied as exhibited in figures 1, 2, 3, and 4, or as represented in figure 5, and as above explained; the whole being constructed so as to operate essentially as specified.”

3. For an *Improvement in Calculating Machines*; William M. Haines, Rochester, Monroe county, New York, May 1.

Claim.—“What I claim, is the combination of the stationary circle A with the circles C and D, fig. 1, and with circles O and 6, fig. 2, in the manner and for the purpose substantially as described. I also claim the combination of the inner circle C, fig. 1, with the ratchet circle b, fig. 2, in such a manner as to move circle 6, fig. 2, one number in one direction for every revolution of circle C in a contrary direction, for the purpose of carrying one to the outer square hole F for every hundred added by moving circle C. I also claim the combination of the pinion 8 with the movable circle D, and the roller 9, screw 10, and wheel Y, and bevel 7, whereby, when the circle D is moved round, the roller 9 and the minor circle plate of E are moved also in conjunction with the circle C, for the purposes set forth.

“I claim the combination, in the manner specified in the above claims, of the mechanical devices, or their equivalents, herein set forth, along with the circles and circle, stationary and fixed, having figures on the same, to produce the arithmetical results substantially as herein described.”

4. For an *Improvement in Printing Paper Hangings*; William M. Shaw, (as joint inventor with, and assignee of, Ezra Gould,) Newark, New Jersey, May 1.

The patentees say,—“1st, The nature of our invention consists in providing a drum, with an eccentric rail or flanch on the same, on which is placed, or connected with it, the slide of a horizontal shaft, for the purpose of giving an intermittent horizontal motion to the frames in which the

blocks are secured that make the impressions on the paper; also in providing a vibrating reciprocating catch bar, to take the paper, when printed, from under the block, drawing it forward on a transverse table, thus making the machine self-feeding.

"2d, The nature of our invention further consists in attaching the platens of the block plates to standards connected to the frames in which the said platens are placed by coiled springs, which spring up both the blocks and platens from the paper after the impression is made.

"3d, It further consists in providing spring pistons, passing vertically through guide eyes attached to suspended jointed arms, to be operated by cams on an upper revolving shaft, the which cams press down regularly the spring pistons on the top of the platens, to make one block impress the paper with color, and the other to receive color from a color sieve."

Claim.—"What we claim as our invention, is the combination of the platens with the block frames by means of the coiled springs, to keep up the blocks from the face of the table, and to allow the said blocks to be pressed down on the paper and color sieves, substantially as described.

"We also claim the arrangement of the cams on the revolving shaft, in combination with the spring pistons in the guide eyes, to press down the platens during the intermission of the motion of the block frames, as described.

"We also claim the combination of the catch bars with the rocker, and the connecting rod and oscillating angular lever, and the arm connected with the block frame, to take the printed paper from under the block, and bring forward the unprinted paper to receive the next impression, substantially as described."

5. For an *Improvement in Trusses*; Gilead A. Smith, assignee of Abijah Smith, City of New York, May 1.

Claim.—"What I claim as my invention, is the mode of applying a truss or supporter, constructed substantially as described; and I also claim making the metallic or spring portion of the truss or supporter, to be applied perpendicularly between the legs, of round or oval wire, in the manner and for the purpose described."

6. For an *Improvement in Artificial Teeth*; Henry Lawrence, Philadelphia, Pennsylvania, May 1.

Claim.—"What I claim as my invention, is making or preparing the tooth with an aperture passing through it, and terminating with a counter-sink, or suitable bearing to receive or support the head of the screw, as herein set forth, as a new article of manufacture."

7. For an *Improvement in Education Tables*; Edwin Allen, Windham, Windham county, Connecticut, May 1.

The patentee says,—"The nature of my invention consists in taking any piece of hard board or other stuff, of suitable size and thickness, and making grooves or channels in any required number in or on its face, and running in any required direction, the same being of any required size and

shape, to receive the sliding types, which are made of solid blocks, with buttons on their lower ends for sliding or moving within the channels, and preventing them being lost or getting off the table."

Claim.—"What I claim as my invention, is the manner in which I make my education tables, substantially as set forth, of two sets or series of grooves, one for the fount, the other for the operations of calculation, in combination with sliding types, the grooves and types so constructed as to prevent the types from being lifted or falling out, and the grooves so arranged that the types may pass by each other as set forth."

8. For a *Self-Regulating Filtering Diaphragm*; William H. Jennison, City of New York, May 1.

The patentee says,—“The nature of my invention consists, 1st, in making a filtering diaphragm to turn on a journal, and provided with a key or handle by which it can be turned, when this is combined with, and so arranged within, an outer shell or case of a spheroidal form, or otherwise so formed as to admit of a free passage of the water or other fluid when the diaphragm is turned longitudinally, but which will have to pass through the filtering medium when the diaphragm is placed transversely, by means of which combination and arrangement either filtered or unfiltered water may be drawn, and by means of which, also, the filtering medium can be reversed within the outer case for the purpose of cleaning.

“The second part of my invention consists in making the filtering diaphragm of one or two movable perforated plates, held within a casing which admits of their being moved towards one another to a certain and definite extent, when this is combined with an interposed filtering medium, composed wholly or partly of sponge or other elastic medium.

“The third part of my invention relates to the mode of packing the outer periphery of the filtering diaphragm, and consists in making two grooves in the said periphery, one on each side of the axis of rotation, and fitting to each groove an annulus of vulcanized India rubber.

“And the last part of my invention relates to the packing of the journal which passes through the outer shell or casing, or for other packing, and consists in filling a metallic case with the appropriate compound of India rubber while the said compound is in a soft and semi-fluid state, leaving a hole in the centre, such as will admit of inserting the journal or other article to be packed, and then baking the said rubber after the usual or any other mode of treating what is called vulcanized rubber; after being properly baked the metal case is soldered or otherwise secured to the outer shell or casing of the filter.”

Claim.—“What I claim as my invention, is the combination of a filtering diaphragm composed of elastic media and movable disks, substantially as described, when combined with an outer shell or case within which it can rotate, either to force the liquid to pass through the filtering medium, or to pass by the side thereof, and issue without being filtered, the stem or journal of the diaphragm being passed through a stuffing box attached to the outer case, as described, or in any other manner essentially the same.

“I also claim making the filtering medium with one or both perforated disks, movable, as described, when combined with an elastic filtering medium, substantially as described.”

9. For an *Improved Right or Left-Hand Lock*; L. R. Livingston, J. J. Roggen, and Calvin Adams, Pittsburg, Pennsylvania, May 1.

The patentees say,—“The principle of our invention is that of constructing a lock in such a manner as to allow of its being used equally well on a door opening either to the right or the left hand, and of being in both cases locked and unlocked by the key inserted in the keyhole with its wing downwards.”

Claim.—“What we claim as our invention, is the constructing a door lock in such a manner as to allow of its being used equally well on a door opening either to the right or the left hand, by means of a keyhole that will admit a key within the lock in reversed positions, in combination with such an arrangement of the movements of the lock as will enable the key to operate the same tumbler and bolt in whichever position it may be inserted within the keyhole.”

10. For an *Improved Gold Washer*; Lewis Jennings, City of New York, May 1.

The patentee says,—“The principle or character of my invention, and that which distinguishes it from all other things before known, consists in the employment of a vertical tube or chamber through which a current of water descends, which tube or chamber is connected with a second tube or chamber containing gold and foreign matters, there being a third or an outer vessel or chamber, with an inclined or curved bottom, so formed and located as to leave a space between it and the lower end of the first and second tubes or chambers, so that the current of water which passes down the first tube or chamber will escape below the lower edge thereof, and move towards the space between the second and the outer casing, so that the gold and all the foreign matters are in still water between the first and second, where, by gravity, they descend without interruption, until they reach the outward current of water from the first tube or chamber, which, acting on the gold and the foreign matters, has sufficient force to separate, by washing, the impurities from the particles of gold, the latter falling by their superior gravity into a cup-formed receptacle below the first tube, whilst the foreign matters, which are of less specific gravity, are carried up by the current, and are discharged over the upper edge of the outer casing.”

Claim.—“What I claim as my invention, is the employment of a chamber or tube, through which a current of water is to flow, when this is combined with a second tube or chamber, which receives the gold and earthy matter, and the third or outer chamber, provided with a bottom so far below the partitions forming the first and second tubes or chambers, as to leave a space for the passage of water from the first tube or chamber to the discharge chamber or outer casing, in the manner and for the purpose specified.”

11. For an *Improvement in Churn Dashers*; Josiah A. Gridley, Southampton, Hampshire county, Massachusetts, May 1.

The patentee says,—“My invention consists in so constructing a churn

dasher as to force air under the cream in the churn, and diffuse the same through it without the employment of valves or other movable parts in the dasher, which are liable to get out of order; and also saving the expense of forming the handle of the dasher hollow."

Claim.—"What I claim as new, is the above described dasher, made concave, with openings around it for dispersing the air throughout the cream without the use of valves, constructed and arranged substantially in the manner set forth."

12. For an *Improvement in Machinery for Making Mats, &c.*; Daniel Hodgman and Amos D. Wyckoff, City of New York, May 1.

Claim.—"What we claim as our invention, is a comb composed of a series of divisions or cells, either entirely separated or otherwise, in combination with the pistons and graduating screws, in manner and for the purpose as described."

13. For an *Improved Method of Making Wire Strengthened Spoons*; Wm. Mix, Prospect, New Haven county, Connecticut, May 1.

Claim.—"What I claim as my invention, is the mode described of making spoons, by first casting them upon a draw tap, with the ends of the spoon handles longer than ordinary, and then, having inserted a wire, swedging the handles to the required and proper shape, completely covering and concealing the inserted wire."

14. For an *Improvement in Valve Seats, &c., for Water Mains*; Theodore R. Scowden, Cincinnati, Ohio, May 1.

The patentee says,—"The nature of my invention consists in so constructing a stop valve for water mains, in all its mechanical arrangements one with another, that, be the water main large or small, the seats can be adjusted to the valve, when wear and tear render such adjustment necessary, without being under the necessity of removing the same from its permanent location in the line of the water pipes."

Claim.—"What I claim, is arranging and combining, substantially as described and represented, or in any analogous manner, the several parts involved in the construction of stop valves for water mains, viz., the chamber, the movable pipe heads, the valve seats, the system of lugs, bolts, and screw nuts, the soft metal and the valve, so that, buried as they must be beneath the frost line in the ground, they can be adjusted in the matter of their valves and valve seats without being removed from their permanent location in the line of the water main."

15. For an *Improvement in Cast Iron Car Wheels*; Isaac Van Kuran, Rochester, New York, May 1.

The patentee says,—"The nature of my invention and improvement consists in casting railroad car wheels with a rim of the form of a semi-ellipsis, and of an oblate spheroidal form at the centre or hub part, with braces on either side, in such a manner as to strengthen the same, remove

all danger of breaking from cooling, and cause the pressure and strain exerted on the hub to be more equally divided over the several parts of the wheel than in the ordinary form of car wheels now in use."

Claim.—"What I claim as my invention, is casting railroad car wheels with a rim of the form of a semi-ellipsis, and of an oblate spheroid near the centre, the hub being cast solid with the same, with braces of the form of *cima-reversa* and *cima-rectas* formed in the valley between the rim and oblate spheroidal shell surrounding the hub, arranged in contrary directions on either side, in the manner and for the purpose set forth."

16. For an *Improvement in Easy Chairs*; Aug. Clark, City of New York, May 1.

The patentee says,—"The nature of my improvement consists in the combining and adapting to the ordinary chair a sliding seat board, so as to draw out at the back of the chair, to expose the permanent seat; a draw slide board, drawing out from the side of the chair, from the under side of the permanent seat board of the chair, for the purpose of covering the chamber box; and a sliding chamber box, arranged in such a manner as to place the convenience of the chair within the reach of the patient at all times, while at the same time, when not in use, preventing the escape of all unpleasant effects from its use in the room."

Claim.—"What I claim, is the employment of the sliding seat board, draw slide for covering the mouth of the chamber box, and the sliding chamber box, in combination with, and as adapted to, an easy or sick room chair, so as to make a portable close-chambered easy chair for the sick room, in form and manner as described."

17. For an *Improved Method of Turning the Drill in Rock Drilling Machines*; Jesse N. Bolles, Providence, Rhode Island, and Henry G. Knight, Boston, Massachusetts, May 1.

Claim.—"We claim the combination of the slotted plate and the friction clasp and its arm, as applied to the drill shaft and main frame, and made to operate in connexion with the elevating jaws, substantially in the manner and for the purpose of rotating the drill as specified."

18. For an *Improvement in the Preparation of Flour for Bread Making*; John Fowler, City of New York, assignee of Henry Jones, Bristol, England, May 1; (anté dated in England March 13, 1845.)

The patentee says,—"The nature of my invention consists in the adding to a certain weight of flour such quantities of alkalines and acids, sugar and salt, as shall, by the addition of water only, enable such prepared flour to be manufactured into bread, &c., without the use of fermenting matter."

Claim.—"What I claim, is mixing both the acid and alkali with the flour in the dry state, sugar and salt being added or not at will, in the manner and for the purpose herein set forth, as a new article of manufacture."

19. For *Improvements for Jointing and Cutting Staves*; Charles Mowry, Elbridge, Onondaga county, New York, Máj 1.

Claim.—“What I claim as my invention, is the combination of the main (stave-cutting) knife with the two jointing knives, and with feeding apparatus, in such a manner that the stave will be jointed immediately before they are cut from the block, and then the block moved forwards into the proper position to be again acted upon by the jointing and stave-cutting knives, in the manner set forth.”

20. For an *Improvement in Electric Telegraphs*; Samuel F. B. Morse, Poughkeepsie, Dutchess county, New York, May 1.

The patentee says,—“The nature of my invention consists, 1st, in the application of the decomposing effects of electricity, produced from any known generator of electricity, to the marking of the signs for numerals, or letters, or words, or sentences, invented and arranged by me, and secured by patent bearing date June 20th, 1840, re-issued January 15th, 1846, and again re-issued June 13th, 1848, or their equivalents, through a single circuit of electrical conductors. 2d, In the mode of applying this decomposition, and the machinery for that purpose. 3d, In the application of the bleaching qualities of electricity to the printing of any desired characters.”

Claim.—“What I claim as of my own invention and improvement, is, 1st, the use of a single circuit of conductors for the marking of my telegraphic signs, already patented, for numerals, letters, words, or sentences, by means of the decomposing, coloring, or bleaching effects of electricity, acting upon any known salts that leave a mark as the result of the said decomposition, upon paper, cloth, metals, or other convenient and known markable material.

“2d, I also claim the combination of machinery as described, by which any two metallic points, or other known conducting substance, broken parts of an electric or galvanic circuit, having the chemically prepared material in contact with and between them, may be used for the purpose of marking my telegraphic characters, already patented in letters patent dated 20th of June, 1840, in the first re-issue, 15th January, 1846, and second re-issue, 13th June, 1848.”

21. For an *Improvement in Corn Shellers*; David O. Prouty, Philadelphia, Pennsylvania, and Ezra Whitman, Baltimore, Maryland, May 29.

The patentees say,—“The first of our improvements consists in cutting out or beveling that portion of space on each side of the driving wheel and pinion, between the teeth on the pinion attached to the beveled wheels, and those on the driving wheel operating the pinion, in such a manner as to present a sharp edge between the teeth of the pinion and the driving wheel, instead of a square bed or plane surface.

“The second improvement consists in making the bevel on the beveled wheels concave, in such a manner that the concave surface so made shall partially enclose or come in contact with a much larger portion of the ears of corn as they pass through the machine, than would be with the ordinary

straight bevel now in use, and so that the outside circumference of the concave may operate as a kind of flanch, which, from its shape, will keep the ears of corn more firmly in contact with the stripping teeth on the sides of the driving wheel.

"The third improvement consists in the combination with, and attachment thereto, of a separator made of an endless belt of slats, operated by a band passing over a pulley attached or fastened upon the shaft of the driving wheel of the shelling machine, thence over a pulley fastened to the end of the shaft of the cylinder operating the endless belt of slats."

Claim.—"What we claim as new, is, 1st, the manner in which we cut out, and bevel off, the spaces between the teeth of the driving wheel and pinion, at the points *a a* in the drawing, so as to present a sharp edge, instead of a plane surface or bed, between the teeth. 2d, We claim the combination of the toothed wheel with the beveled or curved cylinder, arranged in the manner and for the purpose described."

22. For an *Improvement in Sausage Machines*; Thomas Lockett, Warren county, Georgia, May 8.

The patentee says,—“The nature of my invention consists in constructing a hollow conoid, having a tube or nozzle on its apex, and a solid conoid, which is made to turn within the same, by the action of which the meat is minced or ground, and the sausage stuffed, at one operation.”

Claim.—“What I claim as my invention, is the nozzle for stuffing the sausages, in combination with the hollow and solid conoids for grinding or mincing the meat, whether the same are arranged as described, or in any other substantially similar manner, by which the processes of stuffing and grinding can be simultaneously performed at one operation.”

23. For an *Improvement in Broom Brushes*; Agdalena S. Goodman, Duval county, Florida, May 8.

Claim.—“What I claim as my improvement and discovery, is the application and adaptation of the branches of the cabbage palmetto tree to the manufacture of brooms and brushes, (the handles being a portion of the same,) as described.”

24. For an *Improvement in Spring Rake Teeth*; Lyman Baker, Newbury, Merrimack county, New Hampshire, May 8.

The patentee says,—“My invention is intended to overcome the difficulties which are experienced in the mode of applying or affixing a spring tooth to a rake head, which is described and claimed in letters patent granted on the 14th day of March, 1846, to Seneca Ladd.”

Claim.—“What I claim as my invention, is my improved mode of applying each tooth to the rake head: that is, I claim the combination of the spring socket, spring, and tooth, as arranged, constructed, and applied together, and to the rake head, as specified.”

25. For an *Improvement in Trusses*; Lewis A. Hall, Newark, Essex county, New Jersey, May 8.

Claim.—“What I claim as my invention, is two rods of metal, of a proper size and shape, and meeting under the perineum when in use, in combination with the metallic spiral spring or springs, or other analogous device.”

26. For an *Improvement in Washing Machines*; Sylvester Munson and William H. Pratt, Tremont, Tazewell county, Illinois, May 8.

Claim.—“What we claim as new, is, 1st, the combination of the lever, alternating rod, and jointed rods, with the dashers and wash-boxes, whereby two different lots of clothes, in two distinct wash-boxes, may be cleansed at the same time, by the action of two separate dashers operated by one lever.

“2d, We claim the combination of the wells and plungers with the wash-boxes, in the manner and for the purpose described.”

27. For an *Improved Self-Acting Railroad Switch*; Lucius B. Woods, Bradford, Merrimack county, New Hampshire, May 8.

The patentee says,—“The nature of this invention consists in arranging in front of the switch a traversing lever or bar, moving on a pin at its centre, and attaching to the end of the same a horizontal rod, running parallel with the turnout and main tracks, and connected to vibrating plates moving on pieces at the lower end, having levers connected to the same, and springs arranged on either side, and providing the rods arranged parallel with the main track with a pin or track rising from its upper surface, and passing through an oblique slot formed in an oblong plate secured to the end of a beam attached to the vibrating end of the switch, and through a slot parallel with the track, formed in a stationary oblong plate, in such a manner as to enable the engineer to move said switch to connect with the track on which the locomotive is desired to run, by simply moving a lever and causing a horizontal bar to strike the levers attached to the vibrating plates as it passes the same, and move said plates, and the part attached to the same, sufficiently far to produce the desired result.”

Claim.—“What I claim as my invention, is the combination and arrangement of the traversing bar or lever, horizontal connecting rods, oblong plates, containing straight and oblique slots, in which the pin or cog rising from the connecting rod next the main track moves; transverse curved bar secured to the oblong plate containing the oblique slot, and to the vibrating ends of the switch; vibrating plates, having cogs from the upper parts, levers and springs, and horizontal bar, on the locomotive, operated as before stated for moving the ends of the switch either next the end of the rails of the main track, or turnout track, at the option of the engineer or other person to whom the duty is assigned, as set forth.”

28. For *Improved Lugs and Links for Connecting Pipes*; Chapman Warner, Louisville, Kentucky, May 8.

Claim.—“I claim the hooked form of the horns B B, and the wedge-like

form of the horns C C, by which the links or hasps, when applied to the said horns, are made to perform, in a speedy and cheap way, the work of screw bolts in making a tight joint, as described."

29. For a *Method of Operating Railway Switches*; W. C. Hicks, Rutland, Rutland county, Vermont, May 8.

The patentee says,—“The nature of this invention consists in arranging between the rails of the double track a series of notched levers, sliding plates, cords, pulleys, and weights, and other attachments, so combined in relation to each other, and connected to the switch in such a manner, as to cause a projection or cam on the locomotive to operate the levers when the switch is out of position, and cause said switch to assume its proper position with the track before the locomotive reaches the same.”

Claim.—“What I claim as my invention, is the arrangement and combination of the notched lever D G, slotted sliding plates, blocks or keys attached to the levers G by the pins, and chains, pulleys, and weights, operated by a cam or projection on the under part of the locomotive, in the manner and for the purpose set forth.”

30. For an *Improvement in Brewing and Preserving Alcoholic Drinks*; John Hopkins, Brownsville, Washington county, Pennsylvania, May 8.

The patentee says,—The nature of my discovery consists in the preparation of wood, by reducing it into a state of fine division, or of an extract of wood, either of which I employ in various ways, but chiefly in the manufacture and refinement of fermented and unfermented liquors, for the purpose of counteracting the tendency which they have to acetous fermentation, and to correct and improve their flavor.”

Claim.—“What I claim as my discovery, is the preparation and employment of oak, or other woods possessing similar chemical properties, or an extract of such woods, as described, as a substitute for hops, in brewing, distilling, and yeast-making, to refine and improve the flavor of spirituous liquors, as a counteractive of acetous fermentation generally in wines and other fermented liquors, in syrups, in vegetable extracts, and other unfermented liquids, and to correct and improve the flavor of stale wines, cider, or beer.”

31. For an *Improvement in Daguerreotype Apparatus for Gilding Plates*; W. & W. H. Lewis, City of New York, May 8.

Claim.—“What we claim as new, is the application of the frame, constructed with points to convey the plate supported by a movable standard, on a triangular bed, having screws, for the purpose of adjusting the frame and Daguerreotype plate to a level, while gilding or otherwise operating on the same, substantially as described and shown.”

32. For an *Improvement in Saw Mills*; Lemuel Hedge, City of New York, May 8.

The patentee says,—“My invention consists of a saw formed of a plate

of steel, of suitable length, thickness, and width, with the ends joined together, forming a hoop, with saw teeth properly formed and set, on one edge of the hoop, which hoop is passed around two pulleys or cylinders revolving in suitable boxes, and separated from each other a sufficient distance to cause the hoop to become straightened in the parts *c* and *d*, and sufficiently strained by means of two screws *d'* and *a'.*"

Claim.—"What I claim as my invention, is the means described, to preserve, increase, and regulate the tension of the working portion of the saw, when at work, viz., the application of the driving power to the lower pulley when the saw is designed to work in its downward motion, and the application of the break to the upper pulley."

33. For an *Improvement in Bedsteads for Invalids and others*; Francis M. Webster, Newport, Campbell county, Kentucky, May 8.

The patentee says,—“My invention consists of a bedstead or lounge for grown persons, or crib for children, so constructed that the part of it on which the bed rests is suspended with cords, iron rods, or otherwise, and can be moved to and fro, with an oscillating and an undulating motion, either from side to side or from head to foot.”

Claim.—“What I claim as my invention, is, 1st, the setting of the posts in such a manner as to admit of the swinging of the suspended frame, either lengthwise or crosswise of the bed.

“2d, I claim guide boards, worked by straps or otherwise, for giving direction to the motion of the suspended frame.

“3d, I claim the application of the springs to support the guide boards in their places during the operation of swinging.”

34. For an *Improvement in Destroying Weevil in Grain*; William Watson, Chicago, Cook county, Illinois, May 8.

The patentee says,—“My invention consists of a hollow metallic prism, of three or more sides, revolving in a trough, and capable of being heated by steam introduced into its interior through its hollow axis, each side being provided with a series of oblique adjustable cells, for the purpose of subjecting successive small portions of the grain repeatedly to the alternate action of heat and concussion, by elevating it from the bottom of the trough to the top of the prism, and thence projecting it down again into the bottom of the trough, to a point slightly in advance of that whence it was taken, repeating this operation until the grain is moved along from the end of the trough at which it is admitted to that at which it is discharged.”

Claim.—“What I claim as my invention, is the application of the combined action of heat and concussion to grain and other seeds, for the destruction of weevil and other insects, and the eggs and larvæ thereof infesting the same, and separating other foreign matter therefrom, by means of a hollow prism, heated from its interior and turning in a trough, the prism being surrounded by adjustable cells attached obliquely across its sides; the whole being arranged and operated in the manner and for the purposes set forth.”

35. For an *Improvement in Apparatus for Spooling Yarn*; Geo. H. Dodge, Attleborough, Bristol county, Massachusetts, May 8.

Claim.—“What I claim as my invention, is the arrangement or arranging of the point or nose of the spindle within a short distance, (say about one inch, or half an inch, or nearer if possible,) from the yarn-guide which is directly over it, and (that is, in combination with) so applying the spindle to its supporting rail, by means of a hinge slide or other equivalent, that it either may be inclined or turned down out of a vertical position, or be moved or slid outwards to such an extent as to permit a cop to be placed on it without interference with either the guide-rail or the yarn-guide.

“I also claim the arrangement of the friction fether with respect to the yarn-guide, in combination with the so supporting it on the guide-rail by such a contrivance, viz., a hinged arm or slide or its equivalent, as will admit of said fether being moved away from the guide sufficiently for the purpose stated; the said arrangement of the fether with respect to the guide consisting in placing it directly in front of, and partially below, the guide, as described.”

36. For an *Improvement in Machinery for Working Lumber into Irregular Forms*; Rufus Powers, Prescott, Hampshire county, Massachusetts, May 8.

Claim.—“What I claim as new, is the combination of the clamp tongs, wedge, rock-shaft, lever, and inclined planes, with the carriage, as described, for the purpose of holding and supporting firmly slender pieces while being subjected to the action of the cutters, but releasing them while their position is being changed.”

37. For an *Improvement in Sewing Machines*; Jotham S. Conant, Dracut, Middlesex county, Massachusetts, May 8.

Claim.—“I claim the stationary point, (or any equivalent contrivance for supporting one end of the cloth,) and movable or adjustable clamping slider and point, in combination with the line or series of points or wires, the whole arranged and applied together in the manner and for the purpose specified.”

38. For an *Improved Method of Constructing and Operating the Header in Bolt Machines*; D. L. Weatherhead, Providence, Rhode Island, May 8.

Claim.—“I claim as my invention, the double header, constructed with an upsetting hollow frustrum, and a plane or projecting plane face, surface, or die, and made to operate with respect to the gripping dies, in manner as specified: that is to say, by the action of the recess frustrum die, to first form a frustrum on the end of the rod, and next, by the action of the plane die, to upset the same into the head space of the gripping dies, and thereby give to the head the form required; the sunken or recessed die having in the mean time been depressed in such a manner as to bring the flat die into the proper position for the completion of the head.”

39. For an *Improvement in Sewing Machines*; John Bachelder, Boston, Massachusetts, May 8.

Claim.—“What I claim as my invention or improvement in the sewing machine, is the combination, with the endless cloth-holder, of the curved bar or piece of metal, for discharging the cloth from its points after being sewed, as described.”

40. For an *Improvement in Preparing Metallic Patterns for Castings*; Theodore G. Bucklin, West Troy, Albany county, New York, May 8.

The patentee says,—“The nature of my invention consists in converting the surface of iron castings into plumbago, by treating them with dilute acid, which dissolves out most of the iron, but leaves the carbon, which is insoluble in the menstruum, in the form of graphite or plumbago, which, when dry, is capable of being smoothed and polished, so as to make it suitable for the surface of patterns, and for the protection of the interior iron from oxidation.”

Claim.—“What I claim as my invention, is the converting the surface of iron castings into plumbago, by treating them with dilute acid, and then reducing them to the required form and size, and smoothing and polishing them, in the manner and for the purpose set forth.”

41. For *Improvements in Machinery for Laying Ropes*; Martin Guild, Easton, Bristol county, Massachusetts, May 8.

Claim.—“What I claim as my invention, is a combination consisting of the guard, its rope and weight, and the lever shaft, with its arms, spring, shifting lever, and catch; the whole being applied to the spindle in the manner and for the purpose specified.

“I also claim the combination with the lever shaft, having arms, spring catch, and shifting lever, as described, or any other suitable mechanical equivalent for shifting the driving belt from the fast to the loose pulley, the slide bar, the spring lever, having an arm, and the pins inserted in the flyer head; the said combination being for the purpose of arresting the motion of the machine on the breaking of a strand.”

42. For an *Improvement in Annunciators for Railway Carriages*; Mason H. Ford, Boston, Massachusetts, May 8.

Claim.—“What I claim is as follows: 1st, The combination above described, to be operated by a movement of the trigger lever, by the conductor or any other person of the train, the said combination consisting, 1st, of the dial plate or disk and its tubular shaft; 2d, of the index hand and its shaft, the same having a ratchet wheel and retaining pawl, or not, as circumstances may require; 3d, the notched wheel affixed to the dial plate shaft; 4th, the pawl of said notched plate; 5th, the main spring; the said main spring being so connected to the index and dial plate shafts as to cause the dial to operate or turn around in one direction and indicate the stations, the whole being as described.

“2d, I claim, in combination with the mechanism above claimed, the

mechanism for reversing the motion of the dial plate, the same consisting of gear wheels, those fixed on the shaft *n'*, and said shaft, the tri-armed lever, and pinion *t*; the whole being applied together, and to the mechanism before claimed, and made to operate essentially as above described.

"3d, I claim, in combination with the mechanism herein first claimed, the mechanism which retards the rotary movement of the dial plate, and serves as an additional stop motion, the same consisting of the axle, gears, shaft, pinion *b*, catch wheel, and dog; the whole being made to operate and serve the purposes above mentioned.

"4th, I claim, in combination with the mechanism herein before first claimed, the alarm apparatus, the same consisting of the gear wheel, shaft *g*, pinion *h*, escapement wheel *i*, escapement *k*, pendulous hammer and bell; the whole being combined and made to operate as described.

"5th, In order to make the apparatus a self-operating or automatic machine, I claim a combination made up of the following elements or their mechanical equivalents, viz., 1st, one or more cams or inclined planes applied to the railway track; 2d, one or more legs affixed to a shaft connected with the car; also a cord or other contrivance so connected with the trigger lever and the shaft of the car, as to be operated as described when the leg passes up the inclined plane; 3d, the mechanism covered by the claim herein before first made, or any mechanism constructed and made to operate essentially like the same."

43. For an *Improvement in Machinery for Dressing Staves*; Hervey Law, Wilmington, New Hanover county, North Carolina, May 8.

The patentee says,—“The purpose of my invention is to produce a machine which shall dress split staves, whether straight and flat, or crooked and twisted, of equal or unequal thicknesses or widths, wholly in conformity with the grain of the timber, and to joint, bevel, and curve their edges entirely in accordance with the convex and concave faces at every point throughout the length of the staves, so that, when set up with the truss hoops and every part sprung into place, perfectly regular staves shall have been produced, and a symmetrical cask thereby formed, the staves being all of uniform thickness and without cross-cutting of the grain.”

Claim.—“What I claim as new, is the vibrating feeding bar, in combination with the carriage frame, which permits either the elevation or the depression of the rear end of the stave when passing under the weighted levers, as set forth.

"2d, I also claim, in combination, the pressure levers *L L*, acting independently of each other, but each in connexion with a weighted lever *L' L'*, with the elevated plain support, with convex and concave revolving cutters, with the adjustable bevel-edged plate and curved support, forming a throat, whereby a stave, while being pushed forward as described, and undergoing the process of dressing, is held in positions constantly adapted to the various thicknesses, crooks, and windings of the timbers, without liability to be cut across the grain, substantially as set forth.

"3d, I also claim, in combination, the ratchet bar, the lever, tumbling shaft, supporting hand *J*, with the trigger or bent lever *I*, the pawls, the tripping bar and disengaging check on the carrying frame, arranged and

acting temporarily to sustain the stave while its rear end remains between the cutters, and after it has passed from under the weighted pressure levers L L, whereby the under thinning away of the stave near the end is prevented, in the manner set forth.

4th, I also claim the auxiliary saw carriage, in combination with a movable curved roller and springs, for regulating the breadth of the jointed stave to that of the bolt, as ascertained by gauging and adapting the amount of beveling to the breadth, whereby staves of unequal breadths may be so jointed as to be used in setting up the same cask, as herein set forth.

"5th, I also claim the combination of the reversed curved ways and the endless chain, working over angular or toothed rollers, with the swivel-jointed dogs, arranged and acting to receive the dressed stave and carry it forward, first in contact with one saw jointer and then with the other, whereby I am enable to joint successively both edges of the stave before it leaves the machine, and avoid handling the staves after the jointing has been commenced, as set forth.

"6th, I also claim the manner of arranging the adjustable jointing saw, curved roller and supporting springs, projection, and spring bars, whereby the true jointing of straight, crooked, or twisted staves is effected, the roller constituting, with the springs, a throat through which the dressed stave is made to pass in contact with the jointing saw, thereby enabling the bevel in every part of the length to correspond to the cross section of the stave, as set forth."

44. For an *Improvement in Machinery for Cutting Soles of Boots and Shoes*;

Abram D. Boynton, Haverhill, Essex county, Massachusetts, May 8.

Claim.—"What I claim as my invention, is as follows: that is to say, I claim the combination of the four frames, and the moving toe frame, for receiving and holding the shaping blocks of the cutting knives, the said frames being connected and operated by screws, in manner and for the purpose specified.

"I also claim the combination of two sets of holding and shaping blocks, operated as above specified, and whether used on either or both sides of the machine, and for the purpose of sharpening the knife, so as to cut a right or left sole of what are termed 'rights and lefts,' all as set forth."

45. For an *Improvement in Tarring Rope Yarns*; William Montgomery and George H. Williams, Jr., assignees of William Montgomery, Roxbury, Norfolk county, Massachusetts, May 8.

Claim.—"What I claim as my invention, is heating the yarns previous to their immersion in, or passage through, the tar, and using the tar either at the temperature of the atmosphere surrounding it, or at a temperature of blood heat or thereabouts, and not one which small materially volatilize or evaporate its essential oil or spirit, in comparison with the evaporating of the same, which takes place under the old process above described."

46. For an *Improvement in the Combustion of Fuel*; Samuel G. Fisher, Mobile, Alabama, assignee of Richard Coad, Kensington, England, May 8; dated in England November 25, 1847.

Claim.—“What I claim is the mode of constructing furnaces, whereby numerous streams of air are caused to pass above the fire bars, through perforated fire brick, lump, or suitable stone, at the sides and front of such furnaces, in combination with the arrangement for making the products of combustion pass through and beyond reticulate partitions of the same materials, before they come in contact with the surfaces or objects intended to be heated, in the manner and for the purposes set forth.”

47. For an *Improvement in Machines for Cutting and Slitting Cheese Hoops*, &c.; Elkanah Ring, Jr., and Thomas Ring, Worthington, Hampshire county, assignees of Patrick Bryant, Chesterfield, Hampshire county, Massachusetts, May 15.

The patentee says,—“The nature of my invention consists in providing a slitting knife to the stock in such a manner that the stock, with the knife, is attached to the frame with a strap below and a hinge above, so that the knife can be swung on its axis (hinge) to be sharpened. Also in providing a movable face-plate to regulate the thickness of the slit, &c., when a single knife only is used, in combination with which I provide a movable gauge and a movable set of strippers; also a duplicate set of knives in a stock, to cut two slits at one stroke.”

Claim.—“I claim the knife stock, attached to the movable frame in such a manner as to swing up the knife for the purpose of sharpening the same, either by attaching the stock to the frame by hinges above and a clasp below, or for such equivalents as will make the knife stock movable, in the manner and for the purposes set forth.

“I also claim the combination of the movable face-plate with the slide or stock, in such a manner that the position of the face-plate can be changed during the operation of the machine, for the purpose of counteracting the effects produced by the springing of the knife in passing through the central and hardest portion of a piece of wood, and thereby enabling the operator to perfectly govern the thickness of the veneers or splints cut from different parts of the same piece of wood, without stopping the machine.

“I also claim the combination of the pointed slitters with the slide or stock, in such a manner that they (the pointed slitters) can, while the machine is in motion, be thrown into use to act in combination with the knife, when their services are required, and be thrown out of use again without stopping the machine, when their services are no longer needed, as set forth.”

48. For an *Improvement in the Cut-Off and Steam Stop of Rotary Engines*; Benj. Gould, assignee of Joseph W. Webb, Ledyard, Cayuga county, New York, May 15.

Claim.—“What I claim as my invention, is the cut-off valves constructed with apertures through them, and fastened to the steam stops, acting in the manner and for the purpose described.

"I also claim the combination of the cut-off valve, and of the curved apertures, with the arc and radius steam stops, arranged in the manner and for the purpose set forth."

49. For an *Improvement in Chimney Caps*; Charles K. Scudder, Brooklyn, Kings county, New York, May 15.

Claim.—"I claim as new and of my own invention, the application of the obtuse frustrum 2, having holes opening under the frustrum *b*, to admit the exterior current of air into the truncated continuation 4 of the shaft, when such application is in combination with the inverted frustrum *c*, above and detached from, but surrounding, the part 4, to pass the exterior current under the cap *d*; the whole combined and operating substantially as described."

50. For an *Improvement in Harvesters*; James L. and Henry K. Fountain, Rockford, Winnebago county, Illinois, May 15.

The patentees say,—The nature of our invention and improvement consists in giving to the cutting blade a striking motion towards the grain, at the same time that it is drawn transversely against it, which is found greatly to facilitate the cutting, rendering it both more perfect and diminishing the force necessary to effect it."

Claim.—"What we claim as new, is giving to a vibrating blade a compound transverse and horizontal stroke or cut, by combining it with jointed vibrating levers, or other similar device capable of producing the same movement, when the same is combined with stationary teeth or a reel, substantially in the manner and for the purpose herein set forth."

51. For an *Improvement in Bedstead Fastenings*; James Brooke, Baltimore, Fairfield county, Ohio, May 15.

The patentee says,—"The nature of my invention consists in cutting a groove concentric with the circular mortise for the tenon of the rail, inserting a catch-pin therein, and attaching to the rail, in the line of the curve of the concentric groove, when the tenon is applied to the mortise, a hook, wedge-shaped next the rail and from point to butt, so that as it is passed down behind and pressed upon the pin in the concentric groove, it draws the post tightly against the rail."

Claim.—"What I claim, is fastening the post of a bedstead to the rail, (or the rail to the post,) by means of a hook, wedge-shaped from point to butt, next its attachment, and a groove having a catch-pin therein, which groove is concentric with the axis of the joint, substantially as described and set forth, whether placed at one or another point of the sweep of its circle, the hook being correspondingly attached."

52. For an *Improvement in Grain Separators*; Homer Smith, Hector, Tompkins county, New York, May 15.

Claim.—"What I claim as my invention, is the construction and use of a fly or paddle, to carry the grain from carrier to carrier."

53. For an *Improved Lock for Fire Arms*; Jacob Post, Newark, Essex county, New Jersey, May 15.

The patentee says,—“The nature of my invention and improvement consists in attaching to, or manufacturing with, any gun or pistol, or any gun or pistol lock which operates upon the so termed ‘self-cocking’ principle, the seer acting in combination with the set or tumbler *b*, and the adjustable set or tumbler screw *c*, or its equivalent, the effect of each and all of which is described hereinafter.”

Claim.—“What I claim, is the combination of the seer, the set or tumbler, and the set or tumbler screw or its equivalent, whether the same be adjustable or not; the whole acting substantially in the manner and for the purpose hereinbefore described.”

54. For an *Improvement in Straw Cutters*; Jonathan White, Antrim, Hillsborough county, New Hampshire, May 15.

Claim.—“I claim the combination of the rake with one or more sets of reducing or cutting knives or edges, and the conductor straw-holder or shoe, the said rake being made to operate therewith substantially as described.

“I also claim the combination of mechanism by which the rake is operated, the same consisting of the slide bars or rods and their connexions with the rake, one or two of the levers *F*, made with or without its projections as occasion may require, the stop, or the screw, or other equivalent contrivances, applied to each lever *F*; the whole being substantially as specified.”

55. For an *Improved Method of Moving and Fastening Window Blinds*; Cheney Reed, Cambridge, Middlesex county, Massachusetts, May 15.

Claim.—“What I claim as my invention, is the combination of a turning, pressing, or bearing roller, with an inclined plane or cam formed on that portion of the lower hinge which is attached to the blind, substantially as set forth.”

56. For an *Improvement in Packing of Rotary Pumps*; Albigeance W. Cary, Rockport, Monroe county, New York, May 15.

The patentee says,—“1st, The nature of my invention consists in providing a perforated partition or wing between the supply and exhaust tubes and the chamber in which the pistons revolve, to act as a strainer, to prevent sand and other impurities getting into the chamber.

“2d, It farther consists in providing the perforated partition with a metallic butt, having its interior end packed with spring or other packing, so as to have it fit snug or lie in close contact with the revolving drum, and effectually secure a separation between the induction and eduction openings.

“3d, It further consists in providing sliding pistons or valves, which slide in slots in the drum, and in providing said pistons with packing on the outer ends, and also on the upper and under or sliding surfaces; and also in providing the said pistons with small side orifices communicating with interior orifices, to allow a small amount of steam, &c., to get under

the packing when the engine is in operation, to expand gently the packing, and make the pistons move in the chamber in close contact with all parts of the cylinder. In connexion with this part of my invention, I provide spring bolts fitted into openings in the back part of the pistons, and having the heads of said bolts press against the periphery of an interior cam, so as to press out the pistons against the interior rim of the cylinder, so as to have the ends of the piston always in close contact with the said part of the cylinder.

"4th, I also provide circular grooves in the plates of the cylinder or chamber, for the drum to move in, and I provide the said grooves with any kind of packing most suitable.

"5th, I also provide a small groove on each side in the slots of the drum in which the pistons slide, and I provide the said grooves with any kind of packing substance most suitable, to prevent the steam, water, &c., getting into the interior of the drum from the chamber, and also for the purpose of lessening the friction of the pistons when moving in the said slots of the movable drum."

Claim.—"I claim the pistons, packed as described, and with small orifices in the pistons, to allow steam, water, &c., to be admitted, as described, under or inside of the packing when the engine is in operation, for the purpose set forth."

57. For an *Improvement in Atmospheric Churns*; Jos. C. Coult and Aug. B. Davis, Philadelphia, Pennsylvania, May 15; anté dated March 19.

Claim.—"What we claim as our invention, is the air chamber formed by the partition, with the slot and passage. We claim the invention of a churn having a passage formed substantially as above described, and which operates so that the motion of the milk or cream will create a constant supply of fresh air passing in through said passage into the milk and out at another passage, substantially in the manner and for the purpose set forth."

58. For a *Revolving Die Spike Machine*; Nathan Richards, Medford, Massachusetts, and Lucius C. Alexander, Nashua, New Hampshire, assignees of A. M. George, Nashua, Hillsborough county, New Hampshire, and Ephraim Brown, Lowell, Massachusetts, May 18.

Claim.—"What we claim as our invention in each set of griping or beading dies of the series, is the combination of the fixed die, the movable die, the curved bar, the cam plate with its cam, and the arc or cam, the same being applied to the shafts and adjusted together, and made to operate essentially in the manner as specified.

"We also claim the combination of the series of rotating, pointing, and severing dies, the conductor and the series of griping and beading dies, as constructed, combined, and arranged, and made to operate substantially as described."

59. For *Improvements in Boring and Mortising Machines*; Chandler Carter, Manchester, Washtenaw county, Michigan, May 22.

Claim.—"What I claim as my invention, is the combination of an auger

and two chisels with the several parts which regulate their operation, for the purpose of boring and mortising hubs, as the method by which the auger is brought to use through the auger gate, the stands with the arrangement of the pulleys, the operation and government of two chisels through the use of fenders, long cog on chisel stock, slides and spring catch, wedges and rag-iron, rods and springs, stoppers and springs which throw the fenders apart laterally, the combination being more particularly described in the specifications."

60. For an *Improvement in Bench Planes*; Charles S. Beardsley, Auburn, Cayuga county, New York, and Simeon Wood, City of New York, May 22.

The patentees say,—“The nature of the first part of our invention consists in making the surface of the plane, from the cutting edge back, on a level with the cutting edge, and the surface forward of the cutting edge parallel with the rear part, but movable and adjustable, that it may be set so much above the level of the rear part as to determine the thickness of the shaving to be cut, and constitute a guage for this purpose, and thus permit the entire surface of the plane back of the cutting edge to rest and run on the planed surface, whilst the forward part or gauge runs on the part from which the shaving has not been cut.

“And our invention also consists in making one surface of the planing bit or cutter the rear part of the surface of the plane, when this is combined with the making of the rear part of the stock, from the throat of the plane to the back, hollow for the passage and discharge of the shavings.”

Claim.—“We claim constructing and applying the bit or cutter substantially as described, that its lower surface may constitute that part of the surface of the plane back of the cutting edge, in combination with the hollow stock for the passage and delivery of shavings, substantially as described.”

61. For an *Improved Method of Manufacturing Drop Shot*; David Smith, City of New York, May 22.

The patentee says,—“The main feature of my invention consists in causing the fused metal to fall through an ascending current of air, which shall travel at such a velocity that the dropping metal shall come in contact with the same number or more particles of air, in a short tower, than it would in falling through the high towers heretofore found necessary.”

Claim.—“What I claim as new, is the application of an ascending artificial current of air, to cool the descending metal, in the manufacture of drop shot.”

62. For an *Improvement in Speeder Flyers*; Theodore T. Abbot, Manchester, Hillsborough county, New Hampshire, May 22.

Claim.—“What I claim as my invention, is making the flyer of hollow tubular arms, constructed as described, of equal thickness throughout, combined with the top and bottom piece, substantially in the manner and for the purposes set forth, whereby the condensation of moisture is almost

entirely obviated, which is so injurious in practice with the ordinary flyer; the tube through which the roving passes is enlarged to the greatest possible dimensions, the parts are greatly increased in stiffness and lightness, and are found to be more durable and require less power to drive them, and by this mode of construction I am enabled to use a material, to wit, steel, that has never before been deemed practicable."

63. For a *Disk Cut-Off Acted Upon and Regulated by the Governor*; Wm. M'Cammon, Albany, New York, May 22.

Claim.—"What I claim as my invention, is a cylinder moving freely on the spindle of the governor of the steam engine, and operated by the balls thereof, having therein a slot or slots with one vertical and one inclined side, by means of which lever and other apparatus, arranged essentially as described in the above specification, regulate the opening and shutting of a throttle valve in the steam pipe, so as to cut off the steam at any desired portion of the stroke, varying according to the speed of the engine."

64. For *Improvements in Cotton Gins*; William Y. Layton, Darlington, Darlington district, South Carolina, May 22.

Claim.—"What I claim as my invention in the before described improved roller cotton gin, is, 1st, the combination of the adjustable bearings or boxes and screws with the rollers and hinged caps, for supporting, holding, and adjusting the rollers at the several points between their ends, where said bearings are applied and are liable to wear, arranged and operating substantially in the manner and for the purpose set forth, by which the operator is enabled to retain a parallelism of revolving surfaces, however unevenly the bearings may wear; the rollers being made to coincide by separate and independent screws and tops, or wedges, or in any way by which the same object may be attained, and by which the rollers shall be made to produce equal pressure on the cotton wool as it passes between them.

"2d, I likewise claim the combination of the hinged caps with the hinged plate forming the upper end bearings, and the brush block and brushes arranged and operating in such manner as to admit of their being raised from the rolls."

65. For *Improvements in Mill Shafting*; Edward Bancroft, Philadelphia, Pennsylvania, May 22.

The patentee says,—"This improvement consists in making the hangers or bearings which sustain the shafts, in such a manner that they shall, at all times and under any circumstances, conform accurately to the journals of the shafts, and at the same time not be more liable to be thrown 'out of line' than hangers of the ordinary construction; and further, in making the oil-catcher form a part of the box of the hanger, by casting it thereto, thus giving it additional strength without unnecessarily increasing its weight."

Claim.—"What I claim as my invention, is the general arrangement

and construction of the complete hanger, with or without the oil-catcher forming a part thereof, made substantially in the manner and for the purposes above described."

66. For an *Improvement in Hames*; Joseph W. Briggs, Cleveland, Cuyahoga county, Ohio, May 22.

The patentee says,—“The nature of my invention and improvement consists in so constructing and arranging the cliff and padded hames, that the latter will at all times, when the horse is pulling, lay flat and press equally upon every part of his shoulders and breast, which it overlies, which is the only certain and effectual way in which they can be prevented from being pressed and galled.”

Claim.—“What I claim as my invention, is hinging the cliffs to the hame, and extending them back to the girth, substantially as herein described, for the purpose of holding the hame flat against, and in contact with, the entire length of the shoulder of the horse in every position he may assume while in the act of pulling.”

68. For a *Method of Opening, Shutting, and Fastening Blinds*; Wesley Chase, Buffalo, New York, May 22.

The patentee says,—“My invention and improvement consists in casting or otherwise securing pinions, of equal size and similar form, upon the stationary and movable parts respectively of butt hinges, in such a manner that they will both be concentric with the axis of the hinge, and parallel with, and either resting upon or near each other, a turning rack being provided which takes into the pinion of the movable part, which it turns when moved longitudinally either way, and giving to the door or blind to which it is attached a corresponding motion, until it is brought into the required position, when the rack is turned so as to engage its teeth in both the fixed and movable pinion, which thus locks them with the parts of the hinge to which they are respectively attached firmly together, and in this manner fastens the door shut or open at any required angle.”

Claim.—“What I claim as my invention, is the combination of the turning rack with the fixed and movable pinions attached to the hinge, substantially in the manner and for the purpose herein described.”

69. For an *Improved Keyhole Protector*; Edward Kershaw, Boston, Massachusetts, May 22.

Claim.—“What I claim, is a series of slide plates or tumblers, or their equivalents, and a key passage for operating the same, (by means of a key,) so applied to the slide F, and enclosing case A, as to enable a person to insert the key and throw or move the slide or gate forwards or backwards without, (either while the slide or gate is being thrown forwards or is being retracted,) there being any such communication with the interior of the case as will allow of the admission of gunpowder or any explosive solid material therein, substantially as specified, the said slide or bolt tumblers and key passage being enclosed or included in a close box, and the whole forming together a ‘keyhole protector,’ as explained.”

70. For *Improvements in Propelling Vessels by Reaction*; Morris W. Ruthven, City of New York, May 22.

Claim.—“What I claim as my invention, is, 1st, the combination of a centrifugal pump, constructed substantially as described, with the curved guide plates, by which means the water is put in motion, and raised and discharged, with less expenditure of force than the ordinary means now in use for propelling vessels by means of pumps.

“2d, I claim the bent nozzle pipe attached to the stationary pipe, and capable of motion in a vertical plane, by means of which the water may be discharged either fore or aft, up or down, with only one aperture, and without the use of valves.”

71. For an *Improved Method of Lifting Vessels over Shoals*; Abraham Lincoln, Springfield, Sangamon county, Illinois, May 22.

Claim.—“What I claim as my invention, is the combination of the expansible buoyant chambers, placed at the sides of a vessel, with the main shaft or shafts, by means of the sliding spars or shafts, which pass down through the buoyant chambers and are made fast to their bottoms, and the series of ropes and pulleys, or their equivalents, in such a manner that, by turning the main shaft or shafts in one direction, the buoyant chambers will be forced downwards into the water, and at the same time expanded and filled with air, for buoying up the vessel by the displacement of water; and by turning the shaft in an opposite direction, the buoyant chambers will be contracted into a small space and secured against injury.”

72. For an *Improvement in Machines for Jointing Staves*; William H. Seymour, Stocton, Chataque county, New York, May 22.

The patentee says,—“The nature of this invention and improvement consists in securing to an upright sliding frame, operated by any convenient power, a steel knife, curved in the form of a segment of a circle, and made of the form of an obtuse angle on its lower edge, and arranging immediately in front of the same an inclined table or rest, on which the staves to be jointed are placed, in such a manner that, when the sliding gate descends, the knife will cut the edges of the staves to the required bevel and taper, and bilge, and prepare it for setting up without further operation.”

Claim.—“I claim the combination of the inclined angular levers with the oblong plates secured to the edges of the sliding frame, for holding the ends of the stave during the operation of jointing, as described.”

73. For an *Improvement in Imitations of Marble*; Samuel W. Davis, Cincinnati, Ohio, May 22.

Claim.—“What I claim as my discovery in the before described process of marbling minerals, woods, and other substances, is, 1st, the employment of strong acid, as described; in the preparation and application of colors for producing appearances of marble on woods and minerals.

“2d, I claim the application of lime and nitre as receiving mordants,

adapted to minerals and wood where veins or variations are to be produced, imitating marble, as herein set forth.

"3d, I claim the use of mucilaginous pastes, composed of corn meal, slippery elm bark, or rice water, applied to canvas, paper, gum elastic, &c., for purposes stated in the specification.

"4th, I claim the process of preparing, and of transferring, the colors from a temporary to a permanent ground, in the manner and for the purposes described.

"5th, I claim the composition of glass, lime, shellac, nitro-muriate of zinc or aqua regia, and alcohol, as a compound hard polish for marbling wood and porous mineral surfaces, as described."

74. For an *Improvement in Spring Saddles*; Jeremiah Rhoades and Wm.

Pouley, Shippensburg, Cumberland county, Pennsylvania, May 22.

Claim.—"What we claim as our invention, is the combination and arrangement of the bent tension springs, for supporting the saddle seat, with the pommel and cantle of the tree, in such a manner as to effectually preserve the proper form of the springs, and also prevent all upward reaction and tremor of the same when in use, substantially as set forth: to wit, securing the front ends of the springs to the sides of the pommel, by means of bolts or screws, and springing the rear ends of the said springs into inclined grooves formed in the cantle, and confining them therein by screws passing through slots in the springs into the bottom of the said grooves."

75. For an *Improved Shank for Mineral Door Knobs*; Joshua Laird, Cincinnati, Ohio, May 22.

The patentee says,—"The nature of my invention consists in manufacturing mineral door knobs, or other analogous articles, by inserting tubular shanks therein."

Claim.—"What I claim as new, is making mineral knobs or other analogous articles, such as curtain pins, drawer handles, &c., by inserting a tubular metallic shank (with or without slots or a longitudinal slit) into the vitreous or earthen matter at a proper stage of the process, so that the quantity of metal, in proportion to the bulk of mineral admissible in the case, and comparatively to the extent of surface in contact with the mineral, is very small, and the mineral consequently allowed to take its set about, within, or around the more or less elastic shank, without any undue strain upon, or disturbance with its crystallization; thus rendering the destructive tendencies arising from the unequal expansibility of the metal and mineral too slight, practically, to endanger the soundness and durability of the finished knob or other analogous articles, such as curtain pins, drawer handles, &c."

76. For an *Improvement in Scythe Nibs*; David Sawyer, Cornish, Sullivan county, New Hampshire, May 22.

The patentee says,—"The nature of my invention consists, 1st, in making all the parts of the thole on which its attachment to the snath depends of

iron or other metal, by which any wear of the haft at the point of attachment is prevented.

"2d, By securing the ends of the loop by a ring, any welding of the loop is avoided.

"3d, In having the attaching screw, with a pivot point, act in a socket against the inner side of the cap, a less power on the screw is required, an equal bearing or pressure on the sides of the loop is effected, and the thole may be attached to any part of the snath (large or small) without affecting the length of the thole, or requiring any alteration of any part of the iron work.

"4th, By placing the wrench within the barrel of the haft, the loop is first firmly attached to the snath, and then the haft to the attaching screw by the fixed nut, and by being thus separately and independently attached, any derangement of the one will not affect the other.

"5th, The thole may be attached to the snath by a right or left-handed screw, the haft being attached by a left-handed screw in the fixed nut; the first being screwed hard down, will not be affected by the slight force required to secure the latter."

Claim.—"What I claim as my invention, is the wrench part of the screw rod, combined with the rings for fastening the nib upon the snath, as described and represented, to effect the objects stated in the 1st, 2d, 3d, and 4th particulars herein before stated."

77. For an *Improvement in Harvesters of Clover Heads*; John Hinton, Pack's Ferry, Monroe county, Virginia, May 22.

The patentee says,—"The nature of my invention and improvement consists in a novel combination and arrangement of an adjustive pendant bar, to which is secured a row of metallic fingers, and a knife or cutter and right angled mortised plates; and in the arrangement of spring conveyor bars attached to the axletree of the propelling wheel, and caused to rotate with the same, by which the stems or stalks of clover heads are forced against the knife between the fingers, severed, and conveyed to a receiver."

Claim.—"What I claim as my invention, is, 1st, the combination and arrangement of the transverse pendant finger bar, the mortised right angled plates, adjustive slide bars, or knife or cutter, with the revolving axletree of spring conveyor bars, arranged and operating in the manner described, by which the heads of clover are severed from the stems or stalks, and conveyed to a receiver.

"2d, I also claim the combination of the right angled rods, fingers, and pendant bar, with the transverse timber, for adjusting the knife and fingers longitudinally and vertically in connexion with the spring conveyor bars, as described and represented."

78. For an *Improvement in Harvesting Machines*; Alfred J. Purviance, Updegraffs, Jefferson county, Ohio, May 22.

The patentee says,—"The nature of my improvements consists, 1st, in the connexion of the movable knives with the gearing, by means of a slide made on one end of a bar of iron to which the movable knives are

attached, said slide working between ways firmly bolted together, and to a platform, and connecting with a pitman rod, and therefore not liable to become uncoupled, as is the case with many reapers now in use, whilst at the same time there is much less friction, and hence less wear of material.

“My second improvement consists in the manner of constructing the platform separate from the other framework of the machine, whereby the whole of the platform and reel can be removed, and the mower attached in a few minutes ready for mowing.”

Claim.—“What I claim as new, is constructing the platform separate from the other framework, as described, so that it can be readily put together or removed, and the mower attached as described.”

79. For an *Improvement in Buckles for Harness*; Hiram Todd, Columbus, Franklin county, Ohio, May 22.

Claim.—“What I claim as my invention, is the safety plate, buckle frame, and tongue, combined together in the manner and for the purposes set forth.”

80. For an *Improvement in Cooking Stoves*; Daniel Dunham, Pawtucket, Providence county, Rhode Island, May 29.

Claim.—“What I claim as of my invention, is the combination of the central upright steam column with the top plate, and the fire chamber made to rotate or turn around underneath the said top plate, all substantially as specified.

“I also claim the plate K', and space over it, as combined with the fuel chamber and rotary plate, and made to revolve simultaneously with them, in manner and for the purpose essentially as specified.”

81. For an *Improvement in Cooking Stoves*; Horace Halbert, Utica, Oneida county, New York, May 29.

The patentee says,—“The design and nature of my improvement is to furnish a front draft to the stove, directly opposite to the side of the wood to be kindled, while at the same time, by a peculiar arrangement of the valves and flues, a useful distribution of heat is obtained by one revolution of the heated air throughout the stove.”

Claim.—“What I claim as my invention, is the dropping of the flue *s t* below the level of the hearth plate, in combination with the two ovens, arranged in the manner set forth and described.”

82. For a *Direct and Counter-Motion Winch*; Charles Perley, City of New York, May 29.

Claim.—“I claim as new, the application of the female ratchet, conjointly with the mechanical arrangement of the head or cap, with the two reversing pawls and lever socket, to produce a winch that shall be worked

by a handspike or lever, moving in either direction on the winch centre, for the purposes and substantially in the manner before described."

83. For an *Improvement in Machinery for Cutting Welts for Shoes*; Chas. Rogers, East Bridgewater, Plymouth county, Massachusetts, May 29.

Claim.—"What I claim as my invention, is the combination of the strip holder with the knife, base block, spring gauge plate, spring support plate, and ledge; the whole forming a machine for manufacturing welts, substantially as specified."

84. For an *Improved Method of Attaching the Tang to the Handle of Table Cutlery*; David N. Ropes, Meriden, New Haven county, Connecticut, May 29.

Claim.—"What I claim as my invention, is the mode of constructing and combining, or fixing together, the handle and tang of the blade of a knife or piece or cutlery, the same consisting in making the said tang with one or more stationary studs or projections, in combination with making the main tang passage of the handle with lateral and transverse passages for the entrance and reception of the said projection or projections during the process of cementing, all substantially as specified; the handle, by such means, being firmly secured to the blade or tang thereof, and so as to permit no appearance of any rivet on its external surface."

85. For an *Improvement in Bedstead Fastenings*; Devolt Stoltemeyer, Hancock, Washington county, Maryland, May 29.

Claim.—"What I claim as my invention is, the construction of metallic fastenings, for confining the rails and posts of bedsteads to each other, of such forms that, when the portions of the fastening secured in the ends of the rails are inserted into the portions of the fastenings attached to the posts, a blow or downward pressure upon the rails will cause the ends of the rails to be closely drawn against and secured to the posts; when this is combined with the arrangement by which the elevation of the rails for a short distance will permit them to revolve and detach themselves from the cords or sacking that may be connected to them, and also disconnect the portions of the fastenings projecting from the extremities of the rails from their hold upon the fastenings made fast to the posts, without withdrawing one from the other, substantially in the manner and for the purpose set forth."

86. For *Improvements in Boring Machines*; William H. Willcox, Tarrytown, West Chester county, New York, May 29.

Claim.—"What I claim as my invention, is the combination of the boring apparatus with the four jointed posts, the mode of adjusting the frame by means of the straps, and the windlass shafts and the jointed posts, as described."

87. For an *Improvement in Stops for Carpenters' Benches*; Lebbeus Augur and James L. Lord, Chester, Middlesex county, Connecticut, May 29.

Claim.—“What we claim as our invention, is that peculiarity of the construction of the socket which consists in the vertical aperture.”

88. For an *Improvement in Pumps*; George W. Fulton, Baltimore, Maryland, May 29.

Claim.—“What I claim as my invention, is the union of two parallel pump cylinders by means of a curved pipe, as described, and the working of pistons with valves in each, said pistons being united in motion, and the valves arranged substantially as set forth.

“I also claim the union of two such pumps in the manner and for the purpose described.”

89. For *Improvements in Looms*; John Wilson, Gentsville, Abbeville district, South Carolina, May 29.

The patentee says,—“The improvements consist in the shaft commonly called the cam shaft, in the position usually occupied by the crank shaft, and affixing to each end thereof an apparatus which I denominate the quadrangular wheel, that is connected with the lay, so as to give two beats to every revolution of the shaft.”

Claim.—“What I claim as new, is the combination of the quadrant wheel or trammel with the cam shaft of a power loom, by means of which I can locate the said shaft in the position of the crank shaft, and dispense with one shaft and the ordinary gearing connected therewith.”

90. For an *Improvement in Gates*; Lorenzo Smith, Easton, Bristol county, Massachusetts, May 29.

Claim.—“What I claim as my invention, is a single or double gate, constructed substantially as described, so as to turn up vertically by the parallel movements of the rails, &c., in lieu of swinging each way in the ordinary manner.”

RE-ISSUES FOR MAY, 1849.

1. For an *Improvement in Floating Dry Docks*; John Thomas, Elizabethtown, Essex county, New Jersey; patented December 20, 1837, re-issued May 1.

The patentee says,—“The nature of my invention consists in providing a number of strong trussed frames, connected together by strong beams at the upper and lower parts. In the space formed by the frames and beams are placed tanks or floats, in which water is let in through cocks or gates. When the dock is sunk to a depth sufficient to float the ship over the keel blocks, to raise the ship a part of the water is to be pumped out. When the dock, with its load, rises above the water a sufficient height to enable the workmen to perform the various repairs on the bottom

of the ship. Other floats or tanks are placed at each end of each section to preserve the equilibrium."

Claim.—"What I claim as my invention, is, 1st, the end floats, by means of which the dock may be balanced and leveled, and which may be forced down by machinery, substantially as described.

"2d, I claim regulating the line of motion of said floats, and of applying the control exerted by them to the dock by means of guides and frames, in which they are made to move; the whole operating and constituted substantially as described."

2. For an *Improvement in Hot Air Registers*; Charles F. Tuttle, Williamsburg, Kings county, New York; patented January 23, 1849, re-issued May 1.

The patentee says,—“The nature of my invention consists in the new and improved method adopted in opening and closing the register ventilator, by means of an upright or vertical wheel, or a segment of a wheel, which is connected with, and gives motion to, the valves, by means of a movable connecting rod, which is suspended on the side of the wheel on a pin projecting therefrom; and this connecting rod is attached to the valves by pins at their ends.”

Claim.—“What I claim, is the application of the upright or vertical wheel, or part or segment of a wheel, to the opening and closing of hot air registers and ventilators, the edge or periphery of which is placed flush or nearly so with the top surface of the register, and can be acted upon by the foot if desired; the wheel, or part of a wheel, so placed imparting motion to the valves through a connecting rod or rods, which are connected or attached to the wheel at a point distant from its axis, and to the valves by pins at a distance from their centres of motion; the connecting rod or rods moving in a circular direction with, and corresponding to the motion of, the valves that are moved.”

3. For an *Improvement in Atmospheric Churn Dashers*; Charles J. Anthony, assignee of Nathan Chapin, Syracuse, Onondaga county, New York; patented May 9, 1848, re-issued May 15.

The patentee says,—“The nature of my invention consists in the employment of open-mouthed buckets or beaters, having a cavity or cavities formed in their front or beating surfaces, in a vessel partially filled with milk or cream, for the purpose of enabling the buckets or beaters, as they are operated, to pass through air and cream or milk, and thereby to force quantities of air into and amongst the cream or milk, and to lift portions of the cream or milk into the atmosphere in the upper portion of the churn, by means of the said cavities in the beaters, by which the agitating mechanical action produced by the beaters will be greatly increased, at the same time that a chemical influence is exerted by the oxygen of the atmosphere, that will greatly accelerate the production of butter.”

Claim.—“What I claim as my invention, is the employment of open-mouthed buckets or beaters, having a cavity or cavities formed in their front or beating surfaces, in a vessel partially filled with milk or cream, for

the purpose of enabling the buckets or beaters, as they are operated, to pass through air and cream or milk, and thereby to force quantities of air into the cream or milk, and to lift portions of the cream or milk into the atmosphere in the upper portion of the churn, by means of the said cavities in the beaters, for the purpose herein set forth."

DESIGNS FOR MAY, 1849.

1. For a *Design for Stoves*; Morrison & Tibbitts, assignees of Abram Haney, Troy, New York, May 8.

Claim.—"What I claim as my invention, is the design of an air-tight wood parlor stove, as shown and described in the specification and drawings."

MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Account of the Explosion of the Steamboat "Louisiana," at New Orleans.

By A. C. JONES, Esq., Civ. Eng.

(With a Plate.)

On the 15th November, at about 5 P. M., an explosion occurred on board of the "Louisiana," a new first class boat, lying at the levee, which has been more destructive to lives and property than any which has come under my notice. Up to this date, 74 bodies have been found, or have died since the explosion, and 50 remain wounded, some of whom cannot live.

The hull sunk within six or eight minutes after the explosion, carrying down with it many persons entangled in the wreck; about 20 feet, uninjured, of the ladies' cabin floated, and enabled many to be taken from it. The great destruction of lives on shore, was in consequence of the large number of persons which usually assemble to see a boat off. Several were killed hundreds of feet distant by the fragments, and also many on the boats alongside.

On the larboard side of the "Louisiana" was the steamboat "Bostona;" much of her upper works and chimnies were destroyed. The steam drum of the "Louisiana" was thrown on the "Bostona," and remained hanging vertically, by one of the connexion pipes hooking on to the hand rail of the boiler deck, its position being at *r* of the diagram.

The steamboat "Storm" was about making her landing at the time, and nearly the whole of the side of her upper works and chimnies were destroyed; her deck load of cotton protected her from receiving greater injury.

For a clearer understanding of some of the incidents of this explosion, I will give the elevation of the "Storm's" upper works, as our boats differ very much from those at the North. About 10 feet above the main deck (of the hull) is the saloon or cabin, being nearly the whole length of the boat. The top of the cabin, being the hurricane deck, has another story

on it, containing state rooms for the officers of the boat, and still perched above this is the pilot or wheel house.

The accompanying diagram is an approximation of the position of the boats and principal fragments, with their supposed distances from the "Louisiana's" deck.

a, (Plate I.) The "Louisiana."

b, The "Bostona."

c, The "Storm."

dd, The line of the levee.

e, The original position of the boilers.

f, is a large part of one boiler, and the only piece landed that retains its original appearance. (See fig. 3.) It left the boat end on until it passed about 660 feet; it then struck a mule, cutting its entire hind part away, leaving but the two hoofs and small portions of the hind legs uninjured. About the same time a man was mutilated. It then came in contact with some bales of cotton, and left part a loose heap. By this contact it glanced, and its position was reversed; it continued on about 95 feet, knocking down two iron columns of a portico, and landed within a few feet of the wall of the house, with what had been its front end pointing towards the river.

h, is a piece of the shell, about 5×11 feet, flattened out to nearly a plane surface; what were the inside edges of the sheets are chamfered or beveled off, (an unusual thing,) leaving in some places less than half an inch of metal outside the holes.

i, is the place where five pieces of the chimney landed, they being part of the "Louisiana" and "Bostona."

k, is the distance to which a piece of the hog chain (fig. 1) was carried; it is of $1\frac{1}{4}$ inch round iron, about 4 feet long, having a heavy hinged jaw riveted to it. This darted on till it came in contact with a druggist's copper mortar, about 15 feet from the ground, bruising it, and it then passed end on through a sign board 1 inch thick, and lodged in the second story of a house 20 feet off. The great velocity of this bolt cut out a clean piece of the board the size of its flat end, which is compressed to half its thickness, and remains firmly embedded to the end.

l, a small piece of shell doubled up.

m, is one-half of a cast iron head; it is entirely separated from the shell and flues.

n, is a piece of the flattened shell, 6×6 feet.

o, (see fig. 2,) is also a piece of the shell, 8×11 feet, flattened out except a small piece which is doubled over; this has the inside edges of the sheets beveled like *h*. This piece was carried upward about 25 feet, and, after cutting away the front and parts of the side of the third story of the "Storm," remained on the hurricane deck, just filling the oblong space, as seen by the dotted lines, which had been a state room, the bedding and other things being under it. Immediately over this room, two of the upright boards forming the side of the pilot house, were broken in by the body of a negro thrown from the "Louisiana," and he lodged alongside of the pilot, who escaped with a slight cut on the hand.

p, is the place of the safety valve and part of its connecting pipe; the valve and seat are in good order, and the lever is uninjured; no weight has

been found. The safety valve, after ascending in the air, fell on the starboard side of the "Storm's" hurricane deck, passing through it and landing among some china ware in the steward's pantry.

r, the steam drum in a perfect cylindrical state, all the connexions being torn off at the joints.

Fig. 3, is $11\frac{1}{2}$ feet of one of the boilers, taken as it lay on the ground; the head remaining, which is of boiler iron, is partly bent and torn; the flue which was on the starboard side is collapsed the whole length of the shell, and it is partly separated from the head. Two feet of the other flue, also collapsed, remains; it is cracked at its junction with the head. The open end of the shell is of an oval shape; nearly all of what was the starboard chock remains as seen; part of the lead forming its joint is *melted* out. No water line is distinct in this piece of the boiler, *but it has unmistakeable signs of its being much heated.* At s and t, are deep indentations of the line of rivets formed by one of the other boilers, which, coming in contact with its surface, impressed the rivet heads into the shell; in that part enclosed within the hypothenuse of these right angles, the iron is convexing, with a quick curve from the line of indentations. On a part of the shell not seen, being the top when on the boat, are still deeper recesses caused by rivets. The extraordinary appearance of the shell leads me to think that these indentations could only be formed by the iron being very hot, and a great steam pressure within the boiler at the time of contact; otherwise the plates would be concave, instead of having more convexity than is due to the original circle of the boiler.

The "Louisiana," at the time of the explosion, was getting ready to leave, for the purpose of going down to the shipping to take in emigrant passengers. From good information, which the parts of the boiler confirm, the water was very low, and the steam escaping from the weighted safety valve freely. The second engineer, who had charge, ordered the firemen to "open the fire doors," the *doctor was started* to work the pump, and almost instantly the boilers exploded, one after the other in quick succession. Throwing more water into the overheated boilers, may also have been assisted by the "Storm," in landing, coming in contact with the "Louisiana," causing her to list, and surging the water over the highly heated metal, and so *flashing* it into steam. What water fell, was principally in the direction of *h* and *i* of the diagram.

The first engineer was absent on leave, and was, at the time of the explosion, waiting three miles above, at the river, to join the boat when it came up, the engines being left in charge of the second engineer and two "strikers."* The boilers were about six years old; three had been on one boat, and the other was from another boat. The plates ranged above and below one-fourth of an inch in thickness; the parts examined were of medium quality. I should not think that the boilers were deficient in strength for the usual working pressure, (as the great destruction is proof of their strength,) but attribute the explosion to a want of water in one or more of the boilers, and the practice with many young engineers, especially

* "Striker" is the name given to assistants below the grade of second engineer. Sometimes these are men having a full knowledge of engineering, but the low rate of pay does not ensure much efficiency.

with a new boat, of overloading the safety valve at the landing, for the purpose of "showing off" in passing the city front.

The position of the furnace of the boilers I believe has a tendency to produce danger. If the furnace was *afit*, then the engineer could at all times know the exact state of the fire without leaving his post at the engine, and by his better judgment regulating the quantity of fire, so as to avoid the blowing off of steam, and with it the useless waste of water in the boilers; as arranged now, he must go from 30 to 40 feet, to know *correctly* how his fire is. Custom is the only obstacle to a change which would be found to be more economical, and safer.

P. S.—An investigation in secret, by the Coroner, and a public one by the United States Commissioner, has been going on, examining into this explosion. Up to this date, nothing has been elicited to change what I have written, but much has been confirmed by the witnesses, with the exception of one, who states in substance that the two engines were in rapid motion, (all my information was to the contrary,) and the boat kept moving against and from the wharf. I think this opinion must be erroneous, for if the boat was oscillating, no part of the boilers could have got overheated. I once was in a bad fix with a locomotive, on the extreme end of the track, being compelled to keep up the steam to back the train $1\frac{1}{2}$ miles, and knowing the water, from foaming much, was low. I kept the locomotive moving, by steam, to and fro about four feet, (all the room I had,) till the passengers were out, and then backed up. By this means, the brass flues were kept moist, and were uninjured; only 22 gallons of water remained in the boiler.

New Orleans, November 24, 1849.

For the Journal of the Franklin Institute.

Notice of a New Rotary Engine.

A large steamer, intended for the Hudson river, has just been launched in New York. She is 350 feet long, and is to be fitted with a rotary engine, having a cylinder 16 feet diameter; the wheels are attached direct, and are 40 feet in diameter. This vessel is owned by Messrs. Thompson & Hicks, of that city, who are determined that no expense shall be wanting to perfect her machinery, which is being constructed at the West Point Foundry, which is a sufficient guarantee that it will be well executed. We hope they will obtain the success they deserve, although, from the repeated failures that have been made, the case appears a bad one.

For the Journal of the Franklin Institute.

Mode of Grinding Spherical Surfaces. By ERSKINE HAZARD, ESQ.

While reflecting on the operation of Bogardus' mill for trituration or pulverizing hard substances, it struck me that the same principle could be applied to the grinding and polishing of either plane or spherical surfaces, such as mirrors or marble slabs, or the different kinds of optical glasses



Fig. 2.



Fig. 1.

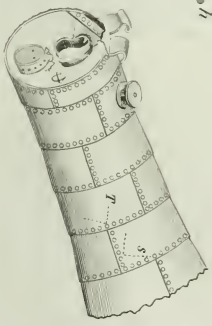


Fig. 3.

EXPLOSION OF THE LOUISIANA.



and reflectors. I send you a sketch of both applications, the figures having the same letters attached to the corresponding parts of both.

a a are parts of a frame, to which brasses are attached, for the spindle *f* of the mill to turn in, and to slide downwards as the grinding progresses. *b* is the pulley for the strap or band to work on; *c* the upper runner, to which one of the flat plates, or a lens, or set of spectacle glasses, is to be attached; *d* the lower runner, which turns upon a spindle in the socket *e*. *d* may have a piece or pieces attached to it, to be ground either flat or concave, or may be a mere friction surface to operate on the pieces attached to *c*.

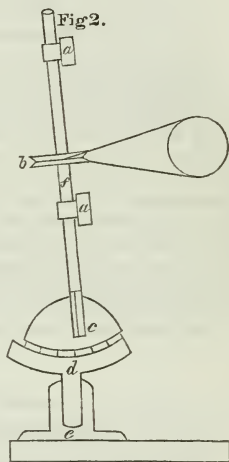
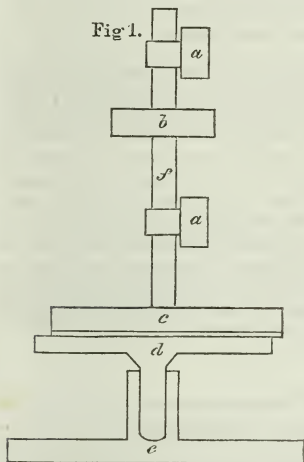


Fig. 1 has the spindles of both the upper and lower runners parallel to each other, but eccentric. The surfaces of the runners must therefore work at right angles with their spindles, and both in the same line, their eccentricity constantly bringing new surfaces in contact as the lower runner is turned by the friction of the upper. It will, therefore, grind perfectly flat.

In fig. 2, the spindles are not only eccentric, they also are not parallel. The surface of each runner will move at right angles with its spindle, the upper one turning the lower one, as in fig. 1, and bringing new surfaces in contact, they cannot fail to cause a truly spherical surface.

In grinding lenses upon the ordinary plan the spindle is concentric with the hollow grinder, which is stationary, and the motion of the block with the glass attached to it, is communicated by a crank on the spindle, which passes into the block and gives it a circular motion round the grinder, at the same time that it turns on the crank by the friction of the grinder. The motion must necessarily be slow, and sphericity cannot be depended

on. On the plan I propose, any motion may be given without affecting the result, and glasses may be ground to much less spheres than can be made with a crank. It will, therefore, have the advantage of expedition and truth, and produce glasses of higher magnifying powers, while it is equally applicable to the manufacture of the largest lenses or reflectors.

The lower runners can have a raised rim projecting from them, to contain the necessary water or oil, with the cutting or polishing substances. It is evidently immaterial whether the power is applied to the upper or lower spindle.

For the Journal of the Franklin Institute.

The Economy of the Steam Engine.

Since the time of Watt, many improvements have been made in the steam engine, some of them being directly intended to increase its economy, while others have been devoted to its form and proportion; but while a great deal has been done, much (particularly in this country) remains to be done. In Cornwall, one pound of coal has been made to do twice as much as Watt was able to perform with it. In this country, the average performance is below that obtained by him. I propose, in a future number, to show the reason why we do not obtain as good a result as we should, and to point out the proper means to be taken to obtain a higher effect than is ordinarily obtained. I will state, in advance, that *I have no patented improvements* to introduce, but wish to show that we all much neglect the means we have at our command, and are paying no attention to the maxim that a penny saved is a penny earned. W.

For the Journal of the Franklin Institute.

Particulars of the Steamship "Philadelphia."

This fine steamer having recently sailed on her first trip to Havana, I send you the following particulars relating to her construction and performance. She is 200 feet long on deck, 33 feet wide, and 18 feet 3 inches deep, and her hull has been built in the best manner by Messrs. Vaughan & Lynn, from the model furnished by Mr. Thompson, President of the Steam Navigation Company, and she has been much admired for her beauty, as well as for the light draft of water obtained.

Her machinery was began by Messrs. Merrick & Towne, and finished by their successors, Merrick & Son. It consists of two side lever marine engines, with cylinders of 56 inches diameter and 6 feet 9 inches stroke. Water wheel, 27 feet diameter; paddles, 8 feet 6 inches long, and 30 inches deep, and with 200 tons of coal on board they dip under 18 inches; without coal they have but 30 inches dip. Each wheel contains 24 paddles, and the whole 30 inches is placed on one side of the arm, not split, as is usually done. The boilers, two in number, are 26 feet 10 inches long, 12 feet 6 inches wide, and 8 feet 8 inches high, having 4 furnaces each, with grates 7 feet long. Anthracite coal, with natural draft, is used, and found to generate an ample supply of steam. On her trial, the en-

gines made as high as 22 revolutions, and gave an average of 19 with 13 inches of steam, cutting off at half-stroke. The engines are fitted with Sickie's adjustable cut-off, which gave much satisfaction.

On the trip to Charleston, she made the run under steam, to Cape Hatteras, in 27 hours, while from there to Charleston Bar, she was 51 hours, caused by a severe gale of wind ahead, the severity of which may be judged when, during its continuance, a speed of 4 miles per hour was the most that could be obtained, carrying 16 inches of steam and working full stroke. The "Southerner," bound from Charleston to New York, laid by 24 hours behind her time, although the wind would have been with her.

The "Philadelphia" is the first side wheel sea steamer built at this port, and her builders may well be proud of their success; she will give them credit wherever she may go. If our merchants had a portion of that enterprise which distinguishes our sister city, New York, the time would soon come when we would have regular lines to Charleston, Havana, New Orleans, Liverpool, and Havre. Until they attempt to divert the stream, they must be satisfied with such trade as may happen to fall to their share.

B.

On a Formula for Calculating the Expansion of Liquids by Heat. By
WILLIAM JOHN MACQUORN RANKINE, ESQ., *Civ. Eng.**

Having been lately much engaged in researches involving the comparative volumes of liquids at various temperatures, I have found the following formula very useful:

$$\text{Log. } V = Bt + \frac{C}{t} - A$$

Log. V represents the common logarithm of the volume of a given mass of liquid, as compared with its volume at a certain standard temperature, which, for water, is the temperature of its maximum density, or 4°·1 centigrade, and for other liquids 0° centigrade.

t is the temperature measured from the absolute zero mentioned in my paper on the Elasticity of Vapors, in the Edinburgh New Philosophical Journal, for July, 1849, and is found by adding 274°·6 to the temperature according to the centigrade scale.

A, B, and C, are three constants, depending on the nature of the liquid, whose values for the centigrade scale, corresponding to water, mercury, alcohol, and sulphuret of carbon, are given below.

	A.	Log. B.	Log. C.
Water,	0·4414907	4·8987546	1·7890286
Mercury,	0·0229130	5·9048766	1·3703897
Alcohol,	0·2615033	4·8414452	1·2893056
Sulphuret of Carbon,	0·2540074	4·8483872	1·2192054

The data from which the constants have been computed have been taken from the following authorities:—for water, from the experiments of Hallström; for mercury, from those of Regnault; and for alcohol and sulphuret

* From the Edinburgh New Philosophical Journal, for October, 1849.

of carbon, from those of Gay-Lussac. As the experiments of M. Gay-Lussac give only the apparent expansion of the liquids in glass, I have assumed, in order to calculate the true expansion, that the dilatation of the glass used by him was $\cdot 0000258$ of its volume for each centigrade degree. This is very nearly the mean dilatation of the different kinds of glass. M. Regnault has shewn that, according to the composition and treatment of glass, the coefficient varies between the limits $\cdot 000022$ and $\cdot 000028$.

Annexed are given tables of comparison between the results of the formula and those of experiment. The data from which the constants were calculated are marked with asterisks.

The table for water shews that, between 0° and 30° centigrade, the formula agrees closely with the experiments of Hallström, and that from 30° to 100° its results lie between those of the experiments of Gay-Lussac and Deluc.

The experiments of Gay-Lussac originally gave the apparent volume of water in glass, as compared with that at 100° . They have been reduced to the unit of minimum volume by means of Hallström's value of the expansion between $4^{\circ}1$ and 30° , and the coefficient of the expansion of glass already mentioned.

In the fifth column of the table of comparison for mercury, it is stated which of the experimental results were taken from M. Regnault's own measurements on the curve, representing the mean results of his experiments, and which from his tables of actual experiments, distinguishing the series.

In the experimental results for alcohol and sulphuret of carbon, the respective units of volume are the volumes of those liquids at their boiling points, and the volumes given by the formula have been reduced to the same units.

Expansion of Water.

Temperature on the Centigrade Scale.	Volume as compared with that at $4^{\circ}1$ C. according to		Difference between Calculation and Experiment.	Authorities for the Experiments.
	the Formula.	the Experiments.		
0°	1.0001120	1.0001082	+ .0000038	Hallström.
*4.1	1.0000000	1.0000000	0.0000000	Do.
10	1.0002234	1.0002200	+ .0000034	Do.
20	1.0015668	1.0015490	+ .0000178	Do.
*30	1.0040245	1.0040245	0.0000000	Do.
....	....	1.0041489	— .0001224	Deluc.
40	1.0075000	1.0074800	+ .0000200	Gay-Lussac.
....	....	1.0077400	— .0002400	Deluc.
60	1.0171800	1.0167000	+ .0004800	Gay-Lussac.
....	....	1.0177300	— .0005500	Deluc.
80	1.0300700	1.0286500	+ .0014200	Gay-Lussac.
....	....	1.0309200	— .0008500	Deluc.
100	1.0457900	1.0429000	+ .0028900	Gay-Lussac.
....	....	1.0466400	— .0008500	Deluc.

Expansion of Mercury.

Temperature on the Centigrade Scale.	Volume as compared with that at 0° C. according to		Difference between Calculation and Experiment.	Remarks.
	the Formula.	M. Regnault's Experiments.		
* 0°	1·000000	1·000000	·000000	Curve.
90·22	1·016333	1·016361	— ·000028	Series I.
100·00	1·018134	1·018153	— ·000019	Curve.
100·52	1·018230	1·018267	— ·000037	Series I.
* 150·00	1·027419	1·027419	·000000	Curve.
198·79	1·036597	1·036468	+ ·000129	Series II.
205·07	1·037786	1·037805	— ·000019	Series IV.
205·57	1·037905	1·037910	— ·000005	Series III.
* 300·00	1·055973	1·055973	·000000	Curve.

Expansion of Alcohol.

Temperature on the Centigrade Scale.	Volume as compared with that at 78°·41 C. according to		Difference between Calculation and Experiment.
	the Formula.	M. Gay-Lussac's Experiments.	
3·41	·91795	·91796	— ·00001
* 18·41	·93269	·93269	·00000
33·41	·94803	·94799	+ ·00004
* 48·41	·96449	·96449	·00000
63·41	·98183	·98210	— ·00027
* 78·41	1·00000	1·00000	·00000

Expansion of Sulphuret of Carbon.

Temperature on the Centigrade Scale.	Volume as compared with that at 46°·60 C. according to		Difference between Calculation and Experiment.
	the Formula.	M. Gay-Lussac's Experiments.	
* — 13·40	·93224	·93224	·00000
+ 1·60	·94768	·94776	— ·00008
* 16·60	·96417	·96417	·00000
31·60	·98163	·98163	·00000
* 46·60	1·00000	1·00000	·00000

*Coals for the Steam Navy.**

We have received the second report on this interesting and important subject, by Sir Henry De la Beche, C. B., F. R. S., and Dr. Lyon Playfair, F. R. S., just presented to both Houses of Parliament. These reports embody the results of a long series of experiments, made at the request of the Lords of the Admiralty, at the laboratory of the Museum of Economic Geology, on a large number of specimens of coal from all parts of the kingdom, and on some foreign coal, on some manufactured fuels, and on coke. The main points of inquiry have been—the evaporative value of the fuel, its mechanical structure, bulk or space occupied in stowage, and the chemical construction of the fuels experimented on.

We are informed in the report that each coal was subjected to experiment for three successive days, the draft being differently arranged for each day; by these means it became easy to ascertain when the gases escaping from the coals were most economically consumed. The mean of the three days gives more correctly the average evaporative value in steam vessels, where the exact draft depends in a great measure on circumstances over which the engineer has little control. The coals most liable to be influenced by different adjustments for the admission of air are those which, from their bituminous characters, are most apt to generate a large quantity of gaseous products on the first application of heat, such as those from the Northumberland, Durham, and Lancashire coal fields; and these, under different areas for the admission of air, vary much more than with the less bituminous kinds of the South Wales field; and in the highly gas-giving coals, as the Cannell coal of Wigan, it was found necessary to admit air behind the bridge, to complete the combustion of the escaping gases.

In experiments to ascertain how far mixtures of anthracite with bituminous coals were likely to prove advantageous in the manufacture of artificial fuel, the apparatus patented by Mr. Warlich, and now used in the dockyards, was placed at their disposal, and the various mixtures were tried under the boiler. It was, however, ascertained that the advantages of these additions was not such as to recommend their adoption. The cementing tar, although partially carbonized by the heat of the coking ovens, was so much more combustible than the dense and difficultly burning anthracite, that the latter remained unconsumed after the combustion of the former, accumulating on the bars in a state of powder, obstructing the draft, or falling through the grate and escaping combustion.

The coals on which experiments were made were selected with the greatest care; inquiries were made at the different ports, as to the kind of coal exported for steam purposes, information from steam navigation companies was obtained, and the local character of the fuel ascertained. Circulars were then forwarded to the owners of such coals, explaining the object, and requesting them to furnish two tons for experiment. In most cases they were sent; some, however, did not comply, and it is therefore probable that many more excellent varieties exist in the several coal fields than are given in Messrs. De la Beche and Playfair's reports. We select from the tables a few of the experiments made, taking the best of each

* From the London Mining Journal, No. 727.

district, the following twelve of which will give an accurate idea of the method adopted of showing their relative values:—

Names of Coals.	Space occupied by a ton.	Weight of a cubic foot.	Water evapor'd by a lb. of coal.	Water evapor'd by a cu. ft.
WALES.	cubic feet.	lbs.	lbs.	lbs.
Thomas's Merthyr,	42·26	53·0	10·16	538·48
Nixon's Merthyr,	43·32	51·7	9·96	514·93
Gadley, 9-foot seam,	40·87	54·8	9·56	523·88
Neath Abbey,	37·77	59·3	9·38	556·23
LANCASHIRE.				
Balcarras Arley,	44·35	50·5	8·83	445·91
Blackley Hurst,	46·66	48·0	8·81	422·88
Blackbrook Rushy Park,	40·50	55·3	8·02	443·50
Laffak Rushy Park,	42·58	52·6	7·98	419·74
NEWCASTLE.				
Andrew's House Tanfield,	42·99	52·1	9·39	489·21
Newcastle Hartley,	44·35	50·5	8·23	415·61
Hedley's Hartley,	43·07	52·0	8·16	424·32
Hasting's Hartley,	46·18	48·5	7·77	376·84

From this table, the twelve descriptions of coal which we select as a specimen, it will be seen that the South Wales coal field produces the best steam coal. It will also be seen that the coal, 1 lb. of which evaporates the most water, is not, as a matter of course, the most economical. For instance, 1 lb. of Thomas's Merthyr evaporates 10·16 lbs. of water, but a cubic foot, weighing only 53·0 lbs., evaporates 538·48 lbs.; while the Neath Abbey, although 1 lb. evaporates only 9·38 lbs. of water, a cubic foot weighs 59·3 lbs. and evaporates 556·23 lbs.; consequently, in evaporating powers, in proportion to stowage, it is the most economical. The same calculations can be made with the others. The following are the chemical constituents of these twelve descriptions of coal:—

Names of Coals.	Specific Gravity.	Carbon.	Hydro.	Nitro.	Sulphur.	Oxygen.	Ash.
WALES.							
Thomas's Merthyr,	1·30	90·12	4·33	1·00	0·85	2·02	1·68
Nixon's Merthyr,	1·31	90·27	4·12	0·63	1·20	2·53	1·25
Gadley, 9-foot seam,	1·33	86·18	4·31	1·09	0·87	2·21	5·34
Neath Abbey,	1·31	89·04	5·05	1·07	1·60	—	3·55
LANCASHIRE.							
Balcarras Arley,	1·26	83·54	5·24	0·98	1·05	5·87	3·32
Blackley Hurst,	1·26	82·01	5·55	1·68	1·43	5·28	4·05
Blackbrook Rushy Park,	1·27	81·16	5·99	1·35	1·62	7·20	2·68
Laffak Rushy Park,	1·35	80·47	5·72	1·27	1·39	8·33	2·82
NEWCASTLE.							
Andrew's House Tanfield,	1·26	85·58	5·31	1·26	1·32	4·39	2·14
Newcastle Hartley,	1·29	81·81	5·50	1·28	1·69	2·58	7·14
Hedley's Hartley,	1·31	80·26	5·28	1·16	1·78	2·40	9·12
Hasting's Hartley,	1·25	82·24	5·42	1·61	1·35	6·44	2·94

A third report will be published, including the remainder of the coals thought necessary to examine; the investigations will continue to be con-

ducted, as before, under the superintendence of Messrs. De la Beche and Playfair, the actual experiments being entrusted to Mr. J. Arthur Phillips. In an appendix to the report, are given the details of each experiment during the three days, the situation, depth, local position, and geological character of each colliery, with copies of the certificates of the owners or agents of the coals under notice, as to their genuineness. The whole forms a most interesting document to those connected with the coal districts, and most important to the Government and steam vessel companies, as guiding them in their choice of a fuel, which, from practical experience, is known will prove the most safe and economical in all long voyages.

On Carbonate of Lime as an Ingredient of Sea Water. By JOHN DAVY, M. D., F. R. S. Lond. & Edin., &c.*

The manner in which limestone cliffs rising above deep water are worn by the action of the sea, as it were by a weak acid, such as we know it contains, viz., the carbonic—the manner, further, in which the sand on low shores, where the waves break, becomes consolidated, converted into sandstone, by the deposition of carbonate of lime from sea water, owing to the escape of carbonic acid gas,—are facts clearly proving that carbonate of lime is, as a constituent of sea water, neither rare of occurrence, nor unimportant in the economy of nature, inasmuch as the phenomena alluded to,—the one destructive, the other restorative,—have been observed in most parts of our globe where geological inquiry has been instituted.

Apart from the economy of nature, the subject under consideration is not without interest in another relation,—I allude to steam navigation. The boilers of sea-going steam vessels are liable to suffer from an incrustation of solid matter firmly adhering, and with difficulty detached, liable to be formed on their inside, owing to a deposition which takes place from the salt water used for the production of steam. On one occasion that I examined a portion of such an incrustation taken from the boiler of the “Conway,” a vessel belonging to the West Indian Steam Packet Company, I found it to consist principally of sulphate of lime, and to contain a small proportion only of carbonate of lime. This vessel had been employed previously in transatlantic voyages, and also in intercolonial ones, plying between Bermudas and the Island of St. Thomas, and in the Caribbean Sea and the Gulf of Mexico.

The composition of this incrustation, like the preceding results, would seem to denote, if any satisfactory inference may be drawn from it, that carbonate of lime is in small proportion in deep water distant from land, and that sulphate of lime is commonly more abundant. The results of a few trials I have made, whilst rather confirmatory of this conclusion, showed marked differences as to the proportion of sulphate of lime in sea water in different situations. That from Carlisle Bay was found to contain 11·3 per 10,000. A specimen taken up in lat. $29^{\circ} 19'$ and long. $50^{\circ} 45'$, yielded about 2 per 10,000, with a trace of carbonate of lime. A specimen taken up off Fayal yielded about 9 per 10,000, also with a trace of carbonate of lime. One taken up off Portland Head, about fifteen miles

* From the London, Edinburgh, and Dublin Philosophical Magazine, for September, 1849.

distant, yielded only $\cdot 4$ per 10,000, part of which was sulphate, part carbonate of lime.

By certain management, I am informed, as by not allowing the sea water in the boilers to be concentrated beyond a certain degree, the incrustation, in the instances of the transatlantic steamers, is in a great measure prevented. Perhaps it might be prevented altogether, were sea water never used but with this precaution, and taken up at a good distance from land, and in situations where it is known that the proportion of sulphate of lime is small. If this suggestion be of any worth, further, more extensive, and exact inquiry will be requisite to determine the proportion of sulphate of lime in different parts of the ocean, and more especially towards land. By the aid of the transatlantic steam navigation companies, means for such an inquiry may easily be obtained; and it can hardly be doubted that the results will amply repay any cost or trouble incurred.—*Proc. Roy. Soc.*

Lesketh How, Ambleside, March 29, 1849.

*The Pottery and Iron Floors of Paris. By MR. GEO. R. BURNELL.**

"Amongst the improvements made in the art of building since the last "Exposition of Industry" in Paris, one of the most important appears to be the application of wrought iron for flooring purposes. As this mode of employing a material we possess in such abundance, and at such very low prices, is but little known in England, some notes upon the subject may be useful. It is to be observed, firstly, that the practice of building in Paris being rarely to make floors of more than from 20 feet to 30 feet bearing, the notes are to be considered as applicable within those limits, unless otherwise specified.

There are three modes of employing wrought iron: firstly, with wrought iron frames, filled in with hollow pots bedded with plaster. Secondly, the wrought iron frames are filled in with light rubble, also set with plaster. Thirdly, the main joists are made of wrought iron, wood trimmers are introduced, and the whole frame-work is then bound together with tie rods.

Firstly, The use of pottery for flooring purposes is far from being of modern invention; instances being met with in the ancient Roman edifices. The round church of Ravenna has walls and a dome of pottery. But the first attempts made to introduce the use of these hollow materials into general practice appears to have been shortly before the revolution of 1789. About that time the Academy of Sciences of France made an elaborate report upon, and even began some experiments upon the force of resistance of, a system of flooring executed entirely in pots and plaster. Iron was, in those days, too dear to allow of its use in ordinary cases; these floors were therefore cambered. During the empire, and in the beginning of the restoration, the vaults of the spirit cellars of the Entrepôt des Vins were executed with skew backs of solid brickwork, and the arches were filled in with pottery; they were about 18 feet span. In the corridors of the Chamber of Deputies, arches from 26 feet to 27 feet span, panelled, and springing from pendentives, were executed in the same manner, as were also some of the circular-headed niches of the Madelaine.

* From the London Builder, No. 383.

In the palaces of Versailles and the Tuilleries, pottery floors have been executed, the dimensions of which are about 66 feet in length by 33 feet in width. But for the usual dimensions of from 20 feet to 30 feet, the usual course adopted is as follows:—

Framed wrought iron girders (consisting of a chord bar $1\frac{1}{4} \times \frac{3}{4}$, with a bar of the same scantling curved so as to rise about 8 inches in the centre, maintained in their respective positions by clipping pieces, keys, and wedges) are inserted at distances of about 13 feet from centre to centre. An intermediate bar, 2 inches by $\frac{3}{4}$ inch, is placed between the girders, and this frame-work is kept in its vertical position by means of cross ties, which pass over and notch down upon the different beams; the cross ties are of $1\frac{1}{4} \times \frac{3}{4}$. Small square bars are laid upon the top of the cross ties, (of $\frac{3}{4}$ inch square iron,) and split rods, $\frac{3}{8}$ inch square, are laid upon these. In fact, a sort of net work is formed, the intervals of which are about 3 feet square, which is subsequently filled with pottery. This is done upon a centre large enough to take one bay at a time.

The pots used for flooring purposes are of two dimensions— $7\frac{7}{8}$ inches high by $4\frac{1}{16}$ inches diameter, and $8\frac{1}{16}$ inches high by $4\frac{1}{8}$ inches diameter. The upper end is beaten into a sort of octagonal form, but the main body of the pots is cylindrical.

A floor executed with pots $7\frac{7}{8}$ inches high, carried a weight of about $3\frac{3}{4}$ cwt. to the foot superficial before breaking. Another floor, executed with pots $8\frac{1}{16}$ inches high, carried $4\frac{1}{2}$ cwt. to the foot superficial.

The French architects have also employed these hollow materials in positions which have allowed them to economize much room, namely, for partitions and party walls. The police authorities some time since called upon the proprietors of the theatre, then called, of the Palais Royal, to separate it from the adjoining tenements by a wall impervious to fire. This end was effected by building a wall 36 feet long by 66 feet high, with hollow pots $8\frac{1}{16}$ inches long, bedded in plaster and rendered on both sides with the same material. Our Building Act would hardly admit of the execution of a party wall of these dimensions, for, with the two coats of plaster, it is barely 11 inches thick, yet experiments have shown that, for the purpose of intercepting the progress of fire, it is established in the most favorable conditions. So satisfied are the French architects with this mode of employing the hollow material, that in many of the most important modern buildings they have repeated its application; as, for instance, in the Palace of the Quai d'Orçay.

Secondly, The wrought iron floors are sometimes executed with ribs or bars, $6 \times \frac{3}{4}$, built into the walls every 3 feet 4 inches apart, when the spans are about 18 feet. Upon these, cross ties of $\frac{3}{4}$ square iron are laid, and split rods $\frac{3}{8}$ thick complete the net work; the cross ties being spaced about 3 feet 4 inches from centre to centre, the split rods about 8 inches apart. The whole of this framing is then filled in solid with light plaster rubble, floated with plaster; care being taken not to carry the works close up against the walls, or the expansion of the plaster would either force them out, or cause the floor to sink.

Floors executed upon this system were first adopted in the year 1845, about the epoch of the great strike of the carpenters of Paris. They are now becoming of general use; but although they resist the transmission of

fire, they are exposed to the very serious objections of being very heavy, of loading the walls to an unnecessary extent, and of being very expensive. In England, moreover, the absence or want of good plaster opposes an insurmountable objection to the adoption of this system. Cement might be substituted, but that is still, notwithstanding the great diminution in price, too expensive to admit of its use in such great quantities.

Thirdly, A. M. Rosier, master carpenter, of Paris, has sent to the Exposition a specimen of a floor, which appears to obviate the objections to the expense of the first system, and the unnecessary weight of the second. Every 3 feet 4 inches apart, he introduces a wrought iron bar, of the shape of an H laid flat, $5\frac{1}{2}$ inches deep; the centre web $\frac{1}{4}$ inch thick, top and bottom flanges $1\frac{3}{4}$ inches wide by $\frac{1}{4}$ inch thick. These bars rest upon the walls, and each alternate bar is tied down with vertical rods. Between these bars, at distances of $19\frac{3}{4}$ inches from centre to centre, trimmers of wood, $5\frac{1}{2} \times 1\frac{3}{4}$, are introduced flush with the under surfaces of the wrought iron bars; and at the side of the trimmers a straining bolt, $\frac{1}{2}$ inch in diameter, is placed to tie the whole system together. The laths and floor boards are fastened to the trimmers, which, at the same time, afford the means of introducing sound boarding and pugging. The wrought iron bars weigh about 29 lbs. to 31 lbs. per 3 feet 4 inches run, or between 13 and 14 kilogrammes to the metre.

These floors are exceedingly stiff, and when covered with tiles, as they commonly are in Paris, they are, for all practical purposes, fire-proof, although certainly not so efficient in this respect as the floors constructed upon the two previously described systems. All the different modes have the great advantage of requiring but little comparative depth. For instance, a floor constructed upon either of the two last named, need not be more than 8 inches thick, flooring and ceiling included, for a span of 20 feet; for a span of 30 feet, 10 inches would be sufficient. A pottery floor of 33 feet need not be more than 13 inches deep, with floor and ceiling.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, December 20th, 1849.

Samuel V. Merrick, President, in the chair.

Thomas Fletcher, Vice President.

Isaac B. Garrigues, Recording Secretary.

John F. Frazer, Treasurer.

The minutes of the last meeting were read and approved.

Letters acknowledging donations were read from the Royal Society, and the Royal Institution, of London.

A communication was read from Mr. Charles Harkness.

Donations were presented from—William C. Redfield and the American Institute, of New York; I. W. P. Lewis, Hon. Joseph R. Ingersoll, and Edward Ingraham, of Philadelphia.

The Treasurer read his statement of receipts and payments for the month of November.

The Board of Managers and the Standing Committees reported their minutes.

The Committee having charge of the arrangement of the Geological Specimens were excused from reporting until the next meeting.

Resignations of membership in the Institute were read and accepted. (3.)

New candidates for membership in the Institute (22) were proposed, and those proposed at the last meeting (141) were elected members of the Institute.

A communication from Henry Perkins, Esq., submitted at a former meeting, was acted on, and the request was not granted.

The communication from Mr. Charles Harkness, submitted this evening, was, on motion, referred to the Committee on Exhibition, with instructions to report at the next meeting.

On motion, the Annual Election for Officers, Managers, and Auditors, was directed to be held on Thursday, January 17th, 1850, between the hours of 3 and 8 o'clock, P. M., and a committee of seven member were appointed to receive the votes and report the result.

Nominations were made for the Officers, Managers, and Auditors of the Institute for the ensuing year, to be voted for at the Annual Election.

Mr. Merrick presented for examination some specimens of caoutchouc, (gum elastic,) which had been vulcanized according to the process of Mr. Goodyear, and used very successfully for steam packing for pistons. They had been exposed, without injury, to a high degree of heat for ten months. He also exhibited some granulated caoutchouc, the result of constant percussion, when used as a buffer, under a heavy steam hammer for several hours.

The Chairman of the Committee on Meetings, Mr. George W. Smith, stated that during the last Spring, when the various forms of Dioptric apparatus for lighthouses were submitted to the inspection of the members of the Institute, he was enabled to suggest an improvement of which the system was susceptible. This improvement had been, at the time, exhibited to a number of lighthouse engineers and men of science, both in this country and in Europe. As it had been deemed practicable by a number of these gentlemen, he now submitted it to the Institute for examination.

It is known that, *originally*, the cupola, or that part of the apparatus *above* the drum or system of lenses of Fresnel, consisted of mirrors which reflected the light passing upwards towards the horizon. In the *fixed* lights, the zones of mirrors of the cupola have been advantageously succeeded by horizontal Catadioptric rings of glass, refracting and totally reflecting the light uniformly in every azimuth; but in the revolving lights, these mirrors (which are not in harmony with the residue of Fresnel's beautiful system) are still retained, and occasion a diminution of light which might be prevented.

Thus, in fig. 1, (which is the left hand *half* of a vertical section of a Dioptric *fixed* light,) D is the drum, and F F are the Catadioptric *horizontal* rings of the cupola, refracting the light proceeding from the radiant point or lamp in the focus to *every point* in the horizon.

Fig. 2, is the right hand *half* of a vertical section of a Dioptric revolving light, or of a light which is to be thrown only in one direction at the same moment. L is the great annular lens; R R R, the Catadioptric rings ar-

ranged in vertical parallel planes, which unite their beams with those of the great lens, L, and project them in the same direction, without the intervention of the small inclined lenses of the cupola, heretofore used, with their accompanying inclined mirrors. With revolving lights of 8 sides, of course *only segments* of these rings would be used;—a system of segments for each division of the cupola, as well as for the portions below the great lenses if expedient.*

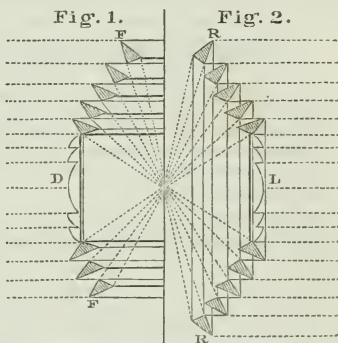
When a powerful light is required in only one, or in two directions, to mark a channel, *complete* rings will be suitable; the spherical reflectors of Fresnel may be used as auxiliaries. As a few persons have imagined that there is a risk in the employment of a single lamp in the Fresnel lights, the extinction of which would leave the horizon in darkness, and thereby jeopard navigation, although this risk is extremely small, Mr. Smith concluded by stating that, if this improvement of the vertical rings be adopted, four

or eight such apparatus, of a smaller size, but of an equal intensity in the aggregate, might be arranged on the the horizontal arms of a Greek cross, each throwing the light in two opposite directions, and the whole revolving; a central fountain supplying the lamp in each apparatus with oil, or each might be furnished with a mechanical lamp, such as Carcel's. If the lamp, with several concentric wicks, consume more oil for a given amount of light than lamps with single wicks, this arrangement might economize the oil, but no opinion is expressed on the latter point. Such small apparatus would require less glass, and have less weight, than those on the plan now in use; the lamps would require no more care than the ordinary fountain lamps; the propriety, however, of substituting a number for the single one now employed, was submitted merely for discussion, without pressing any claim for superiority.

Prof. Cresson remarked that he concurred with the Chairman as to the effects which he had stated to the meeting would result from the adoption of the vertical rings, in lieu of the small lenses and reflectors now in use, and desired that a copy of the plan might be deposited in the Institute, which was assented to.

Mr. Smith proceeded to make some remarks on the usual mode of estimating the economical value of the various methods of illumination, viz., by the intensity of the light, as measured by the photometer, compared with the consumption of material in a given time. He remarked that, although this method was sound in principle if all the circumstances were taken into consideration, yet it frequently led to incorrect conclusions when they were neglected. Thus if a building were to be lighted by a number of

* The rings near the vertical central line are not represented, their section not being in the same plane.



suspended lamps or by gas, suppose the intensity of a given number of the lamps and gas burners, measured as just mentioned, to be equal, the light given by the lamps actually would be less, in some cases, by 14 per cent., in consequence of the interception of a portion of the light by the body of the lamps, whilst, with *suitable* gas burners, little or no light is intercepted. Many gas burners are, however, deprived of this advantage by cups, flowers, or other ornament, injudiciously added beneath the jets.

COMMITTEE ON SCIENCE AND THE ARTS.

Report on Mr. B. F. Palmer's Artificial Leg.

The Committee on Science and the Arts, constituted by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, to whom was referred for examination—"An Artificial Leg," invented by Benjamin Franklin Palmer, of Meredith, New Hampshire,—REPORT:—

That the principles and construction of Mr. Palmer's invention are set forth in the annexed drawing and description. The peculiarities of this invention, however, may be stated to consist partially in—

1st, An ingenious arrangement of the springs and cords on the inside of the limb, by which, when the wearer is in the erect position, the limb is extended and the foot thrown forward; whilst, when he is seated, the limb remains flexed, so as to present a natural appearance.

2d, By a second arrangement of springs and cords, on the inside of the limb, the foot and toes are gradually and easily extended when the heel is placed in contact with the ground. In consequence of this arrangement, the limping gait, and the unpleasant noise made by the sudden stroke of the ball of the foot upon the ground in walking, which are so obvious in the ordinary leg, are avoided.

3d, By a peculiar arrangement of the knee joint it is rendered but little liable to wear, and all *lateral* or *rotary* motion is prevented. It is hardly necessary to remark that any such motion in an artificial leg is undesirable, as rendering its support unstable, while the motion in the hip joint is sufficient to make up, in a measure, for the deficiency in the knee.

The pressure of the artificial leg is made uniformly upon the surface of the sides of the stump, and not upon its end, by which arrangement the danger of inflammation and ulceration of the flaps covering the end of the bone, is, in a great measure, avoided.

The Committee have seen one of Mr. Palmer's artificial legs, worn by himself; it is light, well shaped, easily adjusted, and of a surface readily kept clean; the shape of the limb is such as to represent exactly, when clothed, its natural fellow. Mr. Palmer, who has lost his leg just below the knee joint,—which remains flexed at a right angle, stiff and useless,—is enabled, by means of his invention, to walk without a cane, in such a manner as readily to deceive one not acquainted with the facts of the case.

All the natural movements of the limb, except motion laterally, are beautifully executed; he can throw either leg over the other, and can mount a flight of four or five inches with either leg, indifferently, without assistance.

It is deemed proper to state, that Mr. Palmer retains the entire knee

joint, which, although useless to him as such in walking, yet is of importance, inasmuch as the integuments over the patella are little liable to suffer from the strain upon them, caused by the pressure of the instrument on the sides of the stump higher up. The Committee, therefore, are not prepared to give a positive opinion as to the effects of the use of one of his artificial legs on a patient upon whom the amputation has been performed above the knee, and in whom, consequently, the cicatrix must be exposed to more or less tension while wearing the limb. Mr. Palmer states, however, that the leg may be worn over the most tender stump without inconvenience, and that he prefers a stump of from 7 to 10 inches in length.

In conclusion, the Committee would remark, that the artificial leg of Mr. Palmer is superior to any that has yet come under their notice. It is light, strong, beautifully shaped, apparently very durable, self-acting in a greater degree than any they have ever met with, easy and natural in its motions, and possessing apparently all the qualities desirable or attainable in such an invention.

The Committee would recommend the award, to the inventor, of the Scott's Legacy Medal and Premium, and also, to the Committee on Exhibitions, to award to him the First Premium for his model exhibited in the last Exhibition.

By order of the Committee,

WILLIAM HAMILTON, *Actuary.*

Philadelphia, January 11, 1849.

Description furnished by Mr. Palmer.

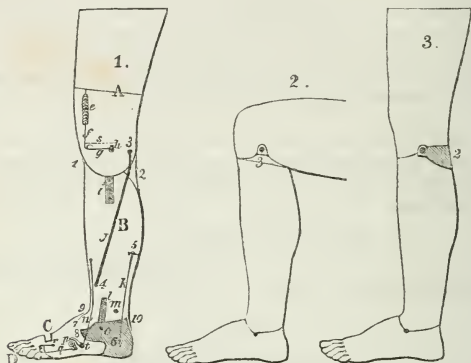
There are four principal parts, viz., the thigh, leg, foot, and toes; see A, B, C, and D, fig. 1. These are usually made of wood, but may be of any other suitable material. The thigh, leg, and foot are hollow, the wood in the interior being excavated, so that only a thin shell or outside is left, making the limb very *light*. The lower extremity of the thigh assumes a hemispherical shape, which may be varied so as to give a correct likeness of the knee it is to mate.

At the junction of A and B, the upper front extremity of B presents a concavity corresponding with the convexity of the lower front portion of the thigh, A, and to the sides of the leg, C, are riveted two metallic plates, of sufficient dimensions to give the articulation the requisite strength. One of these plates, *i*, is fitted to each side of the leg, and fastened in any suitable manner. The tops of these metallic plates pass up a little above the wood, and through them passes a metallic bolt, *h*. Upon one end of this bolt is a flat head, which is countersunk into the side plate; upon the other end is a thread cut, making a screw of it. By means of a slot in the head, this bolt is screwed in to its proper place; in the opposite plate, and with two small screws, which pass through the head and the plate into which it is countersunk, it is fastened so securely that no pressure can start it a hair's-breadth from its fixed position.

This bolt is the axis upon which the thigh revolves, and passes entirely *through* the knee; and the aperture in which it revolves is bushed with any

suitable material, for the purpose of lessening friction and noise. The whole diameter of the knee may bear upon this bolt, or a part of the wood in the interior may be removed from around it, leaving a bearing of not less than *one inch* upon each side.

To this knee-bolt is fastened, in any suitable manner, a lever, *g*, and spring, *f e*. This lever is fastened to, and revolves with, the knee-bolt, is placed horizontally in the vacuum of the thigh, and is acted upon at every motion of the leg by the spring *e f*, which should be so placed as to be at right angles with the lever when the leg is extended.



This spring may be made of vulcanized India rubber, or it may be a metallic coiled or spiral spring. The function of this spring and lever is to make the knee self-acting, or render it capable of extending itself, when flexed, at an angle of 45° , which is about the extent of flexion of the anatomical leg in ordinary walking. When the leg is flexed in the usual sitting position, the thigh being in a horizontal, and the leg in a perpendicular position, (fig. 2,) the spring falls back into a line parallel with the lever, (dotted line *s*.) It is obvious that, in this position, the spring does not act with any considerable force to extend the leg, and it should not, for if it *did*, a continual watchfulness and effort would be required to keep the limb in its proper flexed sitting position.

The front upper extremity of the leg, 1, fig. 1, is beveled to a thin edge, in order to preserve a perfect outline, and is cut away on the rear, 2, so as to give proper motion to the knee. This vacuum is covered, so as to render the exterior perfect, by a piece of flesh-colored wash-leather, 2, fig. 3. In order that you may understand the drawings, I will here say that, in the vertical section, fig. 1, you have an interior side view of all the machinery usually combined in one of my patent legs.

There are two principal tendons, *J k*, one of which fastens to the rear of the thigh and the front of the leg, 3 4, fig. 1, or the lower end may be fastened to the rear of the leg as well as the thigh, or to the foot just forward of the ankle-bolt, *o*. These cords or tendons must be of some flexible

material, very strong, and somewhat elastic, particularly the lower one, which I will now describe.

This tendon, *k*, which is usually made of "cat-gut," fastens to the rear of the leg in any proper and convenient manner, 5, and to the heel, 6. These are new and very important principles, and upon their action depends the utility of the leg in a great degree. The function of the tendon, *J*, first mentioned, is to stop the action of the knee at a proper time. It arrests and stops the forward motion of the leg, as soon as the foot has passed sufficiently far forward for the limb to stand securely. By means of this tendon, we avoid the necessity of having the leg and thigh come in contact with each other, as in the "Anglesea leg," and others which have the tenon and mortise joint. In those legs, the concussion of the parts at the knee produces a most disagreeable jarring sensation, and thumping sound, which are entirely avoided in my substitute. The function of the other tendon, *k*, is to stop the flexion of the angle at a proper time, so as to give a firm bearing upon the ball of the foot at each step, to keep the front lower extremity of the leg, 7, from coming in contact with the foot, 8, and to act conjunctively with the other tendon in regulating the action of the knee joint, and giving a life-like elasticity to the entire limb. Aided by these cords, the knee and ankle are as firm as the natural articulations of the human limb. The wearer steps fearlessly and easily, and the joints have a nature-like elasticity and flexibility.

The metallic parts of the ankle are precisely like those of the knee inverted. The plates, *l*, are riveted, one to each side of the leg, and pass down upon the sides of the foot a little below the leg. Through them, and to them, passes and fastens the angle-bolt, *o*, in the manner before described. This bolt passes through the entire width of the foot, and revolves in a suitable bushing.

The shape of the foot and ankle may be fashioned exactly like the natural ones. The lower front extremity of the leg is an arc of a circle, of which the ankle-bolt, *o*, is the axis. The instep overlaps this arc of the circle, and is beveled to a thin edge, 9, so as to preserve a perfect outline, and overlaps the circular portion of the leg sufficiently far, so that, in flexion and extension, no opening is presented about the joint. The rear lower portion of the leg is also beveled to a thin edge, 10, and overlaps and passes down upon the heel. The extremity of the heel, as far down as the leg overlaps or passes, is also an arc of a larger circle than the one above referred to, and the ankle-bolt is its axis. The parts which overlap move very closely to those which they encase, but do not touch, 9, 10, (1 at knee.) A pin or bar passes through the leg from inside to outside, *m*, which limits the motion of the ankle in extension, by coming in contact with the heel, but the heel does not strike this pin in ordinary walking. On a line parallel with the ankle-bolt, and about in the centre of the foot, a pin passes through, around which a spring, *p*, is coiled. This spring is a continuous wire, the centre coils of which are brought together in such a manner as to form a loop, and pass down perpendicularly towards the bottom of the foot. Through the loop in this arm of the spring passes a gut cord, *g*, and fastens to the bottom of the toes. This arm of the spring, and the cord, regulate the action of the toe joint, and keep the toes at all times in their proper position. In all other artificial feet, there is a con-

stant tendency in the toes to remain elevated, which give a peculiarly artificial appearance, by which the false limb is at once detected.

The outer coils of the spring above mentioned are carried backward and a little downward, constituting another arm, *t*, of the spring. The two ends of this spring are brought together and fastened in a suitable manner, making the spring a continuous wire. To this arm of the spring a cord, *w*, fastens, and, passing up through an aperture in the foot, fastens to the front portion of the leg. This arm of the spring, and cord, regulate the action of the ankle, keeping the foot at all times in a proper position for stepping. Without this, the anterior portion of the foot would drop to the ground, making the step awkward and laborious.

The toes fasten to the foot by one common joint, *r*, but each toe is wrought out in perfect shape, so that on the exterior they appear as though each had a separate joint. A semicircular groove is made across the piece which constitutes the toes, to which the foot is nicely fitted. Through the centre of the circular portion of the foot, which is adjusted to the groove in the toes, *r*, passes a strong metallic wire, which is bent at the sides of the foot and carried forward through the centre of the toes, and to them fastened in a suitable manner. This joint, aided by the foot spring, resembles in all respects the appearance and action of the natural toes, and gives perfect shape to the boot.

The entire exterior is neatly covered with flesh-colored leather, which is drawn so tensely, and fastened so indissolubly, as to give great additional strength to the limb. This covering is coated over with a cement or varnish which I have prepared expressly for this purpose. The varnish is perfectly impervious to water, and presents an enamelled surface and beauty of color which is only rivalled by the exquisite beauty of the human limb.

As will appear in the foregoing specification, the exterior of the limb assumes the exact shape and proportions of the anatomical one, presenting no unsightly gaps or excrescences for the destruction of apparel, &c. The parts which are *new*, and by me *patented* in the *United States* and *Europe*, comprise *very nearly the whole limb*, viz., the *knee*, *ankle*, and *toe joints*, including the *peculiar shapes* of the wood about them, as well as all the metallic parts of the same; the *spring* and *lever* in the thigh; the foot spring, and all the various improved plans of fastening and arranging the various *cords* and *tendons*, as herein described and shown. I have many other new principles, which are frequently used in fitting legs to peculiarly shaped stumps, which it is not necessary to mention at this time.

This kind of leg may be fitted as well below as above the knee, by leaving off all above the knee, 3, fig. 2, and the tendon, *j*. The weight of the wearer is supported by an even pressure of the socket upon the walls of the leg or thigh, above the place of amputation, so that, though the end of the stump may be very tender, yet the leg may be worn with ease. It may be attached to the stump in any of the known and proper forms.

This kind of leg and foot are *lighter*, *stronger*, and *more durable* than any other hitherto known. It is more flexible and elastic, and retains the power of self-action, the utility of which must be obvious. Friction, in it, is reduced to the lowest possible degree, and the articulations are not subject to contraction and expansion.

COMMITTEE ON EXHIBITIONS.

Address Delivered at the Close of the Nineteenth Exhibition of American Manufactures, held by the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, October, 1849. By Hon. JOHN K. KANE.

The Committee on Exhibitions have honored me with an invitation to make an address to you this evening, and I have not felt myself at liberty to withhold so humble a contribution to the cause of which our Institute is the eldest American representative. Yet, I am sensible that their selection has not been a happy one; for the course of thought and reading, to which a sort of necessity has addicted me for some years past, has been too exclusively professional, to allow me the hope of engaging the favorable attention of a mixed audience.

Limited from this cause to a narrow range of topics, I have concluded to offer you a few remarks on the apparent imperfections of our system of Patent Laws,—those laws, which have for their object to protect and reward improvements in the useful arts. The number of such improvements, which must have attracted your notice in the present exhibition, may perhaps invest this subject with a certain degree of interest.

The policy, as well as duty, of returning to inventive genius a fair compensation for the benefits it has conferred upon society, is not in our times a topic for argument. In other countries, its recognition may emanate from what is still called Royal Prerogative, but which is in truth only a trust, held in the name of an individual, for the benefit of the many,—or it may be referred more directly to the popular sense of expediency and justice, as expressed in acts of occasional legislation,—but among civilized states, it is known everywhere, sometimes as a boon of power, more frequently as a right. In our own land, it is expressly declared to be among the powers of Congress, “to promote the progress of science and the useful arts, by securing, for limited times, to authors and inventors, the exclusive right to their writings and discoveries.”

The earliest patent law of the United States was passed by the first Congress that assembled under the Constitution. It was almost of course imperfect; for in the year 1790 no foreign nation had matured a system of provisions on the subject, from which ours could be profitably copied. Nevertheless it was a good law, and contrasted favorably with the law of England of that day: indeed, I have sometimes doubted whether, brief as it is, it does not furnish a better basis for the system than any of those which have followed it. But be this as it may, the legislation of more modern times, if less perfect in its outline, has been progressively more and more liberal in its details; and the Courts of Justice have contributed, by the increasing liberality of their interpretations, to amplify the benefits of the system.

Yet it is still far from perfect: neither the patentee nor the public derives from it the full and appropriate measure of security and benefit. The author of a meritorious invention finds himself, not unfrequently, made poorer

by the letters patent that profess to reward him ; and the mechanical community is infested by swarms of impostors, who bear an apparent title, under the patent laws, to levy arbitrary exactions upon industry.

Let me explain how this happens. An ingenious man has invented a labor-saving machine, and obtained a patent for it. He has begun to use it himself, and has sold licenses to others. It is a highly useful machine, we will suppose,—producing, it may be, an entire revolution in some branch of art ; its usefulness universally admitted, by the unanimity with which it is adopted among his brother mechanics. It is, in a word, just the sort of invention that confers on society the highest benefit, and for which society is most anxious to reward him abundantly.

Now, just in proportion as his invention is valuable, just in that proportion is the temptation to defraud him of it. The invention is at once pirated : litigation follows ; for his exclusive title is worthless, unless vindicated ;—and in this litigation, all who have invaded his rights, and all who have an interest in breaking them down, present a combined front against him.

Libraries are rummaged, to find in ancient books, dreamy, half-formed, unpractical notions, bearing more or less of the same complexion with the matter of his invention ;—witnesses come from every quarter, to tell of contrivances, like his in all but usefulness, that were once upon a time put together, in some rude imperfect mechanism, in some out of the way place,—and then abandoned ;—old machines, that were in the Patent Office before it was burnt, come out from their ashes, refined, improved, gifted with new vigor, by the imaginative memory of old men when talking of things of the olden time ;—scientific theorists are called in, (and there are many such, as impracticable as they are honest, who can see nothing new in any new combination of known agents,) to puzzle us with their arguments, and to demonstrate, that as the lever, and the pulley, and the inclined plane, and the wedge, and the screw, are the cardinal elements of the patented machine, and as in fact it consists of nothing else, therefore the invention has no novelty, and the patent is void.

The poor inventor sits all this time in the Court-room, flushed and fevered, wondering much, and indignant, perhaps, as he hears that the invention, on which he has been wasting his strength and his fortunes for a life-time, was known to all the world before he began, though no one thought of using it till he took out his patent, and every one uses it now.

But he has his witnesses also, his books, and his theorists,—and, peradventure, he has been too poor, or too wise, to retain the ownership of his patent right, and having sold it out to some corporation or some capitalist, he has become disinterested, and may be a witness himself, to detail in person the story of his invention.—

The story has been told ; and his case is now in the hands of his advocates,—skilful and conscientious men, who have sought to master the subject, and have succeeded in so far reviving their college recollections of mechanical science, as to understand and explain the merits of their client.

Their first business is to teach the Judge his lesson ; and this, if we may admit the testimony of the gentlemen of the Bar, is not always an easy one. There are few of us, indeed, that hold the Judicial place, who

must not confess our alienation from all other sciences except our own. The Law is a jealous mistress, that tolerates no divided affections or pursuits among those who aspire to her favors.

But let us suppose this difficulty overcome; and that the Judge has succeeded, during his intervals of leisure, as we term the languid intermissions between the exhausting sessions of his daily Court, in studying as many treatises of mechanics as are indispensable to a knowledge of the subject. The next thing is to enlighten the Jury,—twelve men, gathered by lot, from the streets and the by-ways, to render unanimous verdicts upon oath,—unlearned men, whose office is to determine and apply scientific truths, when the learned disagree,—arbiters of art, often without one particle of instruction in its simplest dialect.

They retire to their Jury-room; and there, without books to enlighten them, but with an occasional newspaper, perhaps, to lead them astray by some distorted view of the evidence, or some ignorant commentary upon it, they begin their consultations for unanimity,—stimulated not a little by the narrow comforts of a closely locked apartment, their “parlor, kitchen, and hall,” on the floor of which, when night comes, they are permitted to spread their mattresses, and dream of that admirable Procrustean device, the boast of Anglo-Saxondom, which claims to expand one conscience and contract another, till they shall coincide. If, under circumstances so favorable to a harmonious conclusion of their labors, they obstinately refuse to think alike, they must be discharged at last;—and the whole affair, with its witnesses, and books, and theories, its expenses and excitement, is to be begun over again, and again, and again,—until twelve “sober and judicious men” are found, to concur in the same “true verdict” upon their oaths.

For the sake of hurrying through this detail of incidents, with which all of us are familiar, let me imagine at once that a verdict has been rendered,—that it is in favor of the patent-right,—and that the Judge is so far satisfied with it, as to refuse the defendant’s motion for a new trial,—and that there is besides no legal excuse for submitting the final judgment, by writ of error, to a Court of Review. The patentee has triumphed,—in one cause,—against one defendant,—in one judicial district. Each new defendant, each new cause, opens anew the whole question of the originality of his invention;—and for each succeeding trial, in each of the thirty odd judicial districts of the United States, from New Hampshire to Texas, between Cape Cod and San Francisco, the patentee is to come prepared, with all his testimony, to encounter the same vexations, and abide the same hazard.

Is this the just and politic reward of inventive talent, for its self devotion to the public benefit?—I have seen men, over and again, who had grown grey in litigation and penury, by seeking to vindicate for themselves the rights, which the faith of the Government was pledged that they should enjoy. I have known a patent, among the most meritorious that have done honor to our country, which, after the lapse of more than twenty years, had produced nothing to the inventor but barren praise and substantial wretchedness, still continuing to “hold the word of promise to the ear, and break it to the hope.”

On the other side, I have said, that the present patent laws do not se-

cure to the public its just and stipulated share of advantages. Under the law now in force, inventions undergo a much more careful scrutiny before the patent issues, than used to be the case. But there are, nevertheless, numerous patent rights in existence, which are without essential merit; and which recoil from judicial scrutiny, either because of a want of originality in the patentee, an imperfect developement of his alleged invention, or some other less innocent, as well as less apparent, defect of character.

The owners, or alleged owners, of these patent rights, are found, from time to time, in the neighborhood of our manufacturing establishments, denouncing infractions of their rights, threatening injunctions in Equity, and suits for damages at Common Law,—but winding up, generally, with propositions for an amicable adjustment, on terms mutually advantageous. Like the applicant for office, that Mr. Madison used to tell of, who began by asking for the emoluments of Secretary of the Treasury, but condescended afterwards to an Inspectorship of the Customs, and closed by soliciting a pair of cast off breeches, these gentlemen become progressively more reasonable as their proffers are refused, and are for the most part content at last to accept, as a black-mail compromise, an amount somewhat smaller than would pay the expenses of a defence against them.

There is, indeed, no effective method, under our present patent laws, for testing the validity of an asserted patent-right, without first violating it, and thus encountering the hazards of a suit for damages. You cannot compel the patentee to come forward, and sustain his right before-hand: on the contrary, the law almost invites him to lie by, and await infractions; as a spider waits for flies to infringe upon the fabric of his ingenuity, and only proves his strength after he has secured a victim to feel it.

You see, at once, what a dangerous power this leaves in the hands of an unprincipled patentee,—how effectually, by the mere semblance of a patent-right, he may deter others from the use of processes or of machinery, to which he has no exclusive right in fact;—since few men are sufficiently confident in their own opinions, or in the opinions of others, to invest large amounts of capital in a business, of which the legality may be disputed, and which, if deemed unlawful by a Court of Justice, may be afterwards arrested by injunction, or mulcted in exemplary damages.—And thus in the result, the public is restrained from the use of inventions, which are in truth public property; having either been patented imperfectly, or fraudulently, or never patented at all by the real inventor.

There may be, and no doubt there are, other defects in our system of patent laws; but these, which I have indicated, are among the most obvious and important. They are, besides, as ancient as the system itself, and have contributed from the first to impair its popularity as well as usefulness. We have all of us known ingenious men, who refused to patent their discoveries, preferring rather to retain a precarious and difficult, but exclusive enjoyment of them, by working in secret; and there are very few mechanicians, who have not been indignant at the frauds to which the patent laws made it their policy to submit.

The injury, which is retorted upon society by this imperfect protection of meritorious inventors, is more extended and full of consequences than it appears to be at first. The man who withholds an important discovery from the world, does not make others poorer, in merely the same degree,

in which he hopes to enrich himself. He limits the circle of useful art, to which the ingenious suggestions of other minds might have expanded his invention. He holds back from his fellows, that strong incentive to progress, the knowledge of what another has achieved. He buries the talent, which should have yielded increase. He is eating the seed wheat, which should have ministered to the abundance of future harvests.

Yet, it would seem as if these defects were none of them really inherent in a system for the protection of inventive genius;—though the remedy for them might, perhaps, involve some startling changes in our venerable forms of forensic procedure.

No one who has studied political history, can undervalue the Trial by Jury, as a safeguard of popular rights. But I have not yet found the frank and well-practised jurist, who would be content to trust to its arbitrament an issue, involving large familiarity with science, acute analysis, or continuous reasonings.

The metaphysics of Social Life, which we denominate the Law, rarely challenge more refined and intricate discussions, than some of the questions which arise under our Patent Laws. The difficulty, which embarrasses the learned in both sciences, is found, not in determining upon those abstract truths, which we call fundamental principles, and which to them are always simple, if not obvious,—but in selecting out from the mass of such truths, those which apply most directly to the particular case, and then in assigning to each its appropriate share of influence or control:—and a weary difficulty it often is, even for the best of us. But what must it be for those, whose minds have undergone no special training in science,—for whom there are no axioms, no starting points in argument, no definitions, no vocabulary, no alphabet even!—For, we think in words; and cannot begin to reason, till we have been instructed in the language of argument.

Imagine the feeling of a conscientious jurymen, who is required to decide a question upon his oath, while he is absolutely ignorant of the very terms in which the question is expressed!—and imagine, too, what confidence, what hope even, there can be for a party, that his rights will be understood and established by any action of twelve such jurymen!—Except to compute the damages which a patentee has sustained, after his claim to damages has been made out, it is often difficult to apprehend what possible good office is to be rendered by a jury in a patent cause. Does it not savor of the grotesque, to call upon such men as compose our juries, to consider of the scientific controversies of chemists and mechanicians,—to follow Professor Henry perhaps upon inductive electricity, in some dispute between the telegraphs,—or to analyze the merits of Mr. Tilghman's method for the alkaline chromates!

Now, why should this be?—Why not refer these questions to men who understand them, or at least to men who can be taught to understand them? When the English Judge of Admiralty is required to pass upon a dispute involving nautical skill, he calls to his aid experts in the art of navigation, ancient masters of the Trinity House, and is indoctrinated by their counsels:—In the same manner, the Judge of a similar Court in our own country invites two or more experienced shipmasters to hear the evidence and arguments with him, whenever the question is one that appeals to a know-

ledge of seamanship and the sea :—And so far as I have heard, decisions made under such circumstances have in every instance satisfied the nautical community;—if even they have not had the more extraordinary good fortune of convincing the parties to the litigation.

They have applied a similar practice in France, to the determination of legal disputes, between the holders of patent-rights, and those who are accused of infringing them. If the Judge does not consider himself conversant enough with the art to which the invention belongs, to allow him to form a confident opinion, he appoints three artists, to enquire whether the alleged invention of the patentee is novel, and whether there has been an infraction of it by the defendant. The report, which is made by this commission, includes a full exposition of the questions of science or of art, which are involved in the case. It is open to a free canvass afterwards, by the counsel of the parties, before the Judge ;—and his adjudication follows. I should think this feature of the French system, an excellent one. We have something analogous to it, in our proceedings in Equity, where we occasionally invite a similar report from scientific men ;—but I do not see why it should not be introduced also into our actions at law, as a substitute for the jury trial, which we have inherited from the English system.

Nor do I see the necessity of leaving the public in uncertainty, as to the extent or validity of a patentee's rights, until some one has been daring enough to violate them, and they have been vindicated after the infraction. The question may be settled just as well before, more speedily as well as economically for the patentee, and much more safely and beneficially for the public. Here, again, I think the French law wiser than our own. "Every man," says one of its commentators, (*Perpigna*, ch. 5, § 2.) "before he begins a commercial undertaking, which may require the investment of a considerable capital, has a right to ascertain whether or not the supposed privilege exists ; because, as the patentee proclaims his exclusive right, every one concerned in the trade, with which the patented invention may be more or less connected, is in constant fear of involuntarily infringing the patent-right, and running the risk of a prosecution and condemnation for piracy." The very moment, therefore, a patent is granted under the laws of France, every one has a right to bring an action for the repeal of it.

Not only would I be disposed to allow every one to contest the validity of a patent-right, in advance of a law suit to recover damages for infringing it ; but I would admit no controversy as to the validity of a patent, in a suit founded on its infraction. I would hold letters patent under the great seal of the United States, to be conclusive evidence of their own validity, so long as they remain unrevoked by a judicial determination. But I would permit the man, who is charged with violating them, as I would permit every other man, to institute proceedings for revoking them at any time.

Of course, such proceedings, to make them conclusive upon the public, must be well guarded against collusion and abuse. They should be conducted with great publicity, and preceded by ample notice,—the specific grounds, on which the patent is to be contested, should be clearly and fully declared beforehand,—all persons whatever should be allowed to

join in sustaining them by facts and arguments,—and the Attorney of the United States for the District, or perhaps a professional representative of the Government, specially appointed to attend upon such investigations, should take part in the case, though without so controlling it as to thwart the action of others. But when such a controversy has been conducted publicly and fairly, I see no reason why the patent, if found fraudulent or defective, should not be declared to be so as to all the world, and thereupon revoked,—nor why, if the patent has withstood successfully the assault of all comers, it should not be exempt from future controversy upon the points solemnly adjudicated in its favor,—leaving it open to impeachment thereafter only upon grounds not before in contest.

A patent, renewed after the expiration of its first term, for causes such as now justify a renewal,—signal merits, namely, and inadequacy of compensation for the good rendered to the public,—I should hold for that reason alone, protected against all further attack on the score of originality or usefulness. Fourteen years, either of general acquiescence in his title, or of successful litigation in defence of it, should earn for the meritorious and ill-rewarded patentee a parting season of repose. *Solve Senescentem.*

This is not an occasion, which could tempt me to elaborate the details of such alterations as I have suggested; and I am sensible, that it must be the work of more time, and more familiarity with our patent system, past as well as present, than belong to me. But it is conceded, that the law as it stands is sorely in need of revision; and it is perhaps the duty of every one, who has been constrained to remark its defects, frankly to suggest what appears to him the most simple and effective remedy.

I trust, too, that I shall not be thought to have chosen an improper forum, before which to make these suggestions. There is no Institution, that exerts so important or so beneficial an influence over the inventive genius of our countrymen, as that before which I am standing at this time;—there is no body of men, among whom it is so easy to find intelligent and skilful counsellors, upon every question, which can interest our mechanics:—and I do not know of any, whose judgment I would so cheerfully defer to, on questions connected with the patent laws. No one, who remembers what mechanics and the arts *were* in Philadelphia, and who sees what they *are*, but bears grateful testimony to the value of the lectureships of the Institute, its public meetings, the labors of its committees, its exhibitions, and its system of premiums, in elevating the tone of our industrial classes, improving their modes of work, stimulating the spirit of invention among them, and enlarging their sphere of thought.

The effect of all this action upon the progress of mechanical science among us, must go on continually increasing. In the old countries, as manufactures have become matured, the division of labor has had a manifest tendency to check improvement in the arts. The artificer, whose whole business of life is to graduate an arc, or to set the knife edge of a scale-beam, will no doubt become apt at his work;—but he cannot be expected to devise modifications of the theodolite or the balance. If he were even to imagine a change for the better in the work which forms his limited department, he could not carry it into effect; for he knows too little of the rest of the machine, to enable him to modify its parts, so as to admit his improvement.

But here,—thanks to the Franklin Institute, which has made our mechanics mechanicians,—and thanks, too, to our system of common schools, which encircles us with a community of intellectual men,—and thanks more than all to the spirit of our political institutions, which stamps Progress on every thing within us and around us,—the American artificer cannot be made to cramp down his thought to the single object of his daily toil. He has asserted his claim to the dignity and the rights of manhood, “looking before and after,” at the past from which he has risen, upon the future to which he aspires. It may be, that he makes a horse-shoe nail more slowly or less neatly than his European grandfather of the trade was wont to do; but he is thinking out a machine, which will make it for him twice as well and a hundred times faster.

To such a man, the teachings of the Institute are of inestimable value. Besides the acquaintance which they give him in those departments that are kindred to his own, they suggest to him topics of enquiry and experiment; making him familiar with what others have done already, and distinguishing for him between that which lies within the possible limits of art, and that which the laws of nature have placed beyond them:—thus dividing him by a broader line from that ancient fraternity of empirics, the so-called practical men, the self-taught, self-conceited, self-vaunting blunderers of the work-shop.

I have only one more observation to make,—and I pray that it may be received with indulgence. The power, which is appropriate to an Institution, constituted and conducted as this has been, imposes a corresponding responsibility on its members. I do not mean, in their aggregate capacity: that is too obvious to call for remark. But the reputation of the entire body is reflected upon its members; and each of them exerts, however unconsciously, an influence, which should not be misdirected. The number of new inventions, which is called for by the growing competition of Industry in all its walks, and which the utmost efforts of mechanical ingenuity are scarcely adequate to satisfy, is daily making it more and more difficult to define the exact extent of each man’s rights as an inventor. What combination shall be regarded as essentially new, where the elements employed are old, and both the object and the result are old also, is sometimes a question of the nicest casuistry. As a consequence, all who have interests to subserve, either by the success or the overthrow of a controverted patent-right, are indefatigable in their efforts to secure in advance the testimonials of scientific men in their behalf,—well knowing how powerfully these may be employed in pre-occupying public sentiment. The importance, which so justly attaches to your opinions, gentlemen of the Institute,—the difficulty, not always apparent at a glance, of arriving at correct conclusions without special examination,—and the magnitude of the interests, which may be affected injuriously by a judgment, hastily expressed,—these together form an argument for the gravest caution, whenever you are individually solicited to take a position, either favorable or adverse, to the claims of a patentee.

In conclusion, I perform a most grateful office in congratulating my brother-members of the Institute upon its condition and prospects, and thanking them for the attention and courtesy with which they have listened to me.

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FOR THE
PROMOTION OF THE MECHANIC ARTS.

FEBRUARY, 1850.

CIVIL ENGINEERING.

*The Britannia Bridge—Progress of the Work.**

[Although the Britannia Bridge for railway traffic across the Menai Strait does not yet hang in mid air, there has been no real delay in the process of raising it. On the contrary, while the process adopted is somewhat slower than that originally contemplated, it is one that takes an efficient guarantee against calamity. The published accounts are, for the most part, very confused and inaccurate; but our readers will be able to understand what is going forward from the account with which we have been favored by a scientific correspondent.]

The tube, by the operation of floating, was left resting at the foot of the towers, each end being there supported on a shelf of stone, so that, at the highest state of the tide, there was a space of about three feet between its bottom and the water. Here, until last Friday, it remained while the preparations were making in the upper part of the towers for raising through the 100 feet necessary to attain the "103 feet above high water spring tides" demanded by the Admiralty, both in this case and in that of the Menai Bridge.

These preparations consist of an hydraulic press of immense power in each tower, with the steam engine and pumps necessary for the working of each; and of the lifting chains which hang down from the presses and take hold of the recumbent tube below. These chains had to be put together on the top of the tube, and then got up from thence into their dependent position. They do not consist of short links one within the other, like a common chain, but are like those of a suspension bridge, the links being six feet long.

The hydraulic press is placed in the highest part of the tower, so as to

* From the London Mechanics' Magazine, for August, 1849.

be clear above the tube when lifted into its ultimate position. It consists of a close cylinder of great strength, with a ram or solid piston working through a water-tight collar in the top; the ram bearing across its top a cross head or beam of cast and wrought iron in combination, to each end of which is fastened the upper end of each line of lifting chains, of which there are two at each end of the tube. The immense scale of the whole thing may be judged from the fact that this cross head alone weighs more than 15 tons, and the two lifting chains at each end about 50 tons; of themselves they look quite a sufficient load for the press without the 1800 tons below. As this ram rises from the pressure of the water thrown into the cylinder by the pumps, the cross head rises too, carrying up with it the chains and therefore the tube, till a "stroke" of six feet is completed.

Here the operation stops, and means are taken to secure the chains at the foot of the press, while the ram is being lowered to the bottom of the cylinder again. This is done (and in less time than its description has taken) by clipping the links of the chain with "clams," which are blocks of iron able to be brought near together by a screw like the sides of a vice; they are supported on the beams on which the press rests, and are made to fit under "shoulders" or notches at each joint of the chain. This being done, the ram is lowered down, the top length of chain above the clams taken off, connexion again made to the cross head, and all is ready for another lift. It was the original intention of Mr. Stephenson, having once begun to lift, to do so at both ends simultaneously, and so to continue, making consecutive lifts as fast as possible, by which the whole would have been accomplished in about eighteen hours; but the terrible consequences of any failure in the chains, during the time when the dead weight would have been hanging on them, has made him adopt a slower method, in which one lift of six feet is made in the twenty-four hours, first at one end and then at the other, the tube being followed up underneath by wood packings, which, during the remainder of the day, are taken out and replaced by solid masonry. The lift takes on an average 38 minutes. The operation was begun on Friday evening, (10th August,) and the whole height reached to-day (16th August) is 27 feet, everything having hitherto proceeded without the least impediment or failure.

The second tube, which will be the continuation of this one, will be floated immediately after the raising is completed—probably about the middle of September; and it will be lifted without delay.—*Spectator*, Aug. 18.

Since the above was written, the following account of an unfortunate interruption to the progress of the works has appeared in the *Liverpool Journal*:—

BANGOR, Friday Evening, Aug. 17, 1849.

"All the fond and desired hopes of a successful realization of raising the monster tube of this stupendous bridge to its final resting place are, for the next two months at least, suspended.

"A few minutes before noon of this day, the lower part of the cylinder of the huge hydraulic press on the Anglesea side burst with a tremendous explosion, and in its descent on to the tube, a height of about 84 feet, fell with a terrific crash. The press was at work at the time, and had raised the tube about three feet during the lift this day; and had it not been for the very urgent and precautionary means adopted by packing and bricking

under with cement as the tube was being raised, the most dreadful consequences were inevitable.

"One of the workmen was precipitated from a rope ladder running from the top of the tube to the recess in which the hydraulic machine was fixed; he was struck by the huge mass of iron in its descent, weighing nearly three tons, and now lies in a dreadfully crushed state.

"Mr. Frank Forster, the resident engineer, with his staff, was quickly on the spot, and I am happy to add that no other accident has happened.

"This most disastrous affair is to be attributed entirely to a defective casting of the cylinder, and the raising of the tube will, consequently, be delayed some time until the completion and fixing of the new one in its place. The tube is now raised about 21 feet from the base."

*The First Great Tube of the Britannia Bridge.**

On Saturday forenoon last, (October 13,) the first great tube, (or iron tunnel,) out of four tubes between the towers, required for the double line of the Chester and Holyhead Railway, in crossing the Menai Straits, was safely hoisted to its final resting place or level, without accident to life or limb. Each tube weighs about 1800 tons, and contains about 317,000 rivets. The stone work, including the abutments, comprise about 1,500,000 cubic feet. The one just elevated was hoisted by two 40 horse power steam engines, one at the top of one tower and one at the top of the other, and both acting on powerful hydraulic machines, lifting chains six feet in length of link. All the preparations are complete for the floating of the next tube, which will take place about the middle of November. The day at present fixed on, should no unforeseen contingency occur, for the completion of one highway, and the transit of the first train over the Straits, is the 1st of March next. The hoisting is conducted by Mr. Clarke and Mr. Amos; Captain Claxton, R. N., superintends the floating off of the tubes.

Coal Mining Three Hundred Years Ago.†

In this age of experiment, it may be interesting to know some of the fancies in connexion with coal mining in past times. In the Bodleian Library there is a manuscript, written in Greek, by one Nivander Nucius, from which the following has been extracted:—"In this city (Ciege) and all the neighboring country, they are accustomed to burn a certain black, shining, stony substance, producing hot embers without smoke; but when the substance (coal) has been consumed, it yields no cinders, but a very fine dust, which is scattered through the air. These stony substances they dig out of the deepest recesses of the earth, finding certain veins from which they extract them; but a peculiar prodigy takes place when they are about to commence digging. The miners are accustomed to excavate at a distance of eight or more stadia from the city, below the river, about 30 cubits or more. When they meet with this mineral, they form a spacious cavern;

* From the London Railway Magazine, October 20, 1849.

† From the London Mining Journal, No. 725.

but they are not able to throw out the mineral immediately, for fire on a sudden bursts forth, and encompasses the whole cavern. When the miners are desirous of extracting the coal, they put on a linen garment, which has neither been bleached nor dipped in water; this covers them from head to foot, leaving only certain apertures for the eyes; they also take a staff in their hands, which serves to guide and direct their steps in the passage leading to the cave. The miner then draws near to the fire, and *frightens* it with his staff. The fire then flies away, contracting itself little by little. Having then expended itself, it collects itself together in a surprising manner, and becomes very small, remaining quite still in a corner. But it behoves the man wearing the linen garment to stand over the flame when at rest, always terrifying it with his staff. Whilst he performs this service, the miners extract the stones; but as soon as they have left the cave, the dormant fire on a sudden bursts forth, and environs the whole cave. No one then ventures to enter without the aforementioned garment and staff, for he would be inevitably consumed. And this we ourselves have beheld, being admirers of the operations of Nature." Can modern science unriddle the mystery of the garment and staff?

*A New Method of Graduating Levelling Staves, by which they may be much more accurately read, and at much greater distances, than at present. By MR. J. D. PEMBERTON.**

At the present time, when drainage of towns with reference to sanitary arrangements, and drainage of lands in connexion with agricultural improvements, engage so large a portion of public attention, the suggestion of any real improvement in the instruments usually employed in practical levelling, is certain to be listened to with attention, if not with approval, by the numerous body of professional gentlemen now occupied in conducting the operations alluded to. The great benefit conferred upon engineers and architects, as a body, by Mr. Gravatt, by the arrangement which superseded the use of the sliding-vane in levelling staves, is too well known and appreciated to require comment: while, however, Mr. Gravatt's method is in general far superior to the old one, there are two particulars in which it is usually admitted to be inferior to it—viz. 1st, *the trouble and attention required to read the minute divisions on the staff*—an important point when we reflect on the vast number of readings taken in a single day's levelling; and, 2d, *the difficulty of reading them at any considerable distance*. In order to remedy these defects, several eminent engineers and others have, at different times, proposed methods of graduating, which, however, seem to have failed to supersede that originally introduced by Mr. Gravatt. To ascertain the reason of this, as well as their comparative merits in connexion with some by other engineers, I made a series of experiments on all such levelling staves, of new construction, as I could meet with; a very brief account of the results of which may not be uninteresting, and should perhaps, in justice to the inventors, accompany these remarks, in which shall be proposed a method of graduating levelling staves, which will, I

* From the London Civil Engineer and Architect's Journal, for December, 1849.

believe, entirely get rid of the two difficulties already mentioned, without any counterbalancing disadvantage. Two levels were used, a 10-in. and a 12-in. focus of Troughton's, in the experiments. The staves compared were as follows:—

No. 1. Mr. Gravatt's: 10ths clearer and more readable at long distances than, perhaps, in any other; 100ths read generally with distinctness at about 8 chns.—10 chns. should not be exceeded; in this Mr. Williams coincides in his "Practical Geodesy," p. 63. On the whole, this staff has the advantage of all that have appeared since; in which opinion I am supported by Mr. Bourne in his "Principles and Practice of Engineering," p. 210.

No. 2. A mode of dividing, invented and adopted by Mr. P. N. Barlow, C. E.; the object being to obtain greater distinctness and less liability to error. The divisions are composed of triangles, each occupying $\frac{1}{20}$ th of a foot, except that at the even tenth, which is diamond-shaped, to render it more defined than in other staves. The chief advantage of this arrangement consists in the greater distinctness with which the point of intersection of the triangle, and the hair-line of the telescope is defined, compared with the horizontal divisions, and their parallelism with the hair-line. The peculiar difficulty of setting two parallel lines to coincide with one another is well known to astronomical observers, who can bisect a dot with greater precision than two of the finest lines are known to agree.—*vide Encyc. Metrop.*

No. 3, preferred by Mr. Castle, ("Land Surveying," p. 255,) goes by the name of "Stephenson's," and was first used on the London and Birmingham. The 100ths are obtained in the same way as in the common ivory protractor; the 10ths of a foot through the whole length of the staff are bisected, making the two divisions 20ths; and these division lines extend the whole breadth across the staff. The opposite ends of these lines are connected by diagonal lines, each one with its preceding—viz., the left of No. I. with the right of No. II., the right of No. II. with the left of No. III., and so on. And five vertical lines are drawn, at equal distances, along the whole of the staff, which thus divides each of these diagonal lines into five equal parts, each being $\frac{1}{5}$ th part of $\frac{1}{20}$ th, or $\frac{1}{100}$ th part of a foot.

No. 4. Mr. Sopwith's: this on trial seemed altogether too complicated, and the subdivisions too minute. Mr. Bourne's remarks on this staff seem decidedly judicious—page 211 of the work before quoted: "Several attempts have been made at improvements in this (Mr. Gravatt's) staff, but their success is very problematical. Mr. Sopwith, for instance, has introduced one in which distinctive figures are attached to every-other 100th of a foot; the mechanical construction also differs from this,—it is more elaborate, which consequently makes the staff more expensive. It is very neat, however, but is subject to injury in windy weather."

No. 5. A staff of my own invention, constructed with cylinders of block tin, the largest $3\frac{1}{2}$ inches diameter, to slide one within another, which seemed to afford great strength and lightness, and formed, besides, a case to carry plans in,—the particular object aimed at being, by obtaining a surface of 9 to 11 inches, to mark every 100th of a foot by a dot and figure, running in a spiral line from bottom to top; it should, of course, revolve

slowly during observation. On actual trial, however, Mr. Gravatt's staff seemed preferable.

No. 6. A staff which, on actual trial, seems capable of being read with more distinctness at short distances than any staff now in use, and with facility at between four to five times the usual distance; it is graduated by an application of the *upright vernier*, the principle of which is usually expressed in the formula,

$$(n-1) L = n V;$$

$$\therefore L - V = L - \frac{n-1}{n} L = \frac{1}{n} L$$

L and V being the length of a division on the staff and vernier respectively. And since to propose any form of sliding vernier would have been at once rejected, as introducing the old vane in a new form, I have got over the difficulty in the following manner:—

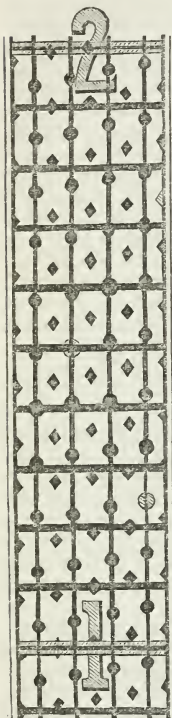
By inspecting the diagram, it will be seen that there are 9 rows or columns of stars or dots, which it is impossible to confuse in a lateral direction one with another. The initial position of the first star in the first of these rows is zero on the staff; the others follow in regular succession at intervals of 100th foot between each; then, all the stars in any one row are $\frac{9}{100}$ ths of a foot from centre to centre, while the lines drawn across mark $\frac{1}{10}$ ths of feet as usual: one star will therefore be found at every $\frac{1}{10}$ th-foot, which is useful to recollect in graduating a staff in this manner.

In reading such a staff, we first read the feet and $\frac{1}{10}$ ths of feet as usual; then, suppose the cross-hair of the diagram to occur anywhere within some particular $\frac{1}{10}$ th, observe which dot or star it intersects, then count dots or stars upwards, in its vertical line, until a coincidence with a horizontal line is found: the numbers so counted will represent $\frac{1}{100}$ ths of feet, and consequently give us the second decimal place.

The great advantage gained is simply this: that whereas in all the staves now extant, we are obliged to distinguish between hundredths, to obtain the second place; in this levelling staff, we attend to no subdivisions less than $\frac{9}{100}$ ths-foot apart, to obtain equal accuracy. On trial, it will be found that this staff can be read with facility at $\frac{1}{4}$ -mile sights. I found it practicable at 35 and 40 chains, with a 12-in. focus.

I should recommend the horizontal lines to be put in in vermillion, as the contrast between black and vermillion will be found distinct at the utmost distance at which any staff can be read.

Royal Agricultural College, Cirencester, Nov. 9, 1849.



*Report on recent Applications of the Wave Principle to the Practical Construction of Steam Vessels. By MR. J. SCOTT RUSSELL.**

During the last year I have had more than one opportunity of applying the wave principle to the construction of steam vessels. There is one case, however, in which I have been able to apply it to practice under circumstances of greater complexity and difficulty than have ever occurred to me, and where it has been successful in overcoming difficulties to a greater extent, and in a more decided manner, than heretofore.

During the last year a very difficult problem was proposed to me. It was this:—To build a steam vessel that should be fast without great length, a good sea-boat without drawing much water, and to carry a great top weight and yet swim very light. Besides, this vessel was to be able to go backwards as well as forwards equally well; and, though a small boat, was to contain great accommodation. The problem is one to which the wave principle is far from seeming peculiarly applicable. In the first place, it is well known that the wave principle prescribes a different form of the bow from that of the stern, in order to obtain most speed with least cost of power. In the second place, it is known that a high speed requires, on the wave system, a very considerably greater length than was here allowed for the entrance of the vessel or the lines of the bow. It would, therefore, seem at first to be a case that would prove too difficult for the successful application of the wave system.

There is one more feature in the case which gives it interest. At the same time the same problem was worked out by another party on another plan of construction, *not* on the wave principle. Another vessel was built under similar conditions, with engines of the best construction, made by one of the most eminent engineers in England. Both of these vessels were built at the same time, and tried under similar circumstances; therefore, here was a case in which the practical value of the wave principle has been brought to a test more direct and less questionable than any that was likely to have occurred—and, therefore, more important to be placed on the records of the British Association.

The first question which will naturally occur to a member of this Association, who recollects this principle, will be this: How could you apply the wave principle in a vessel made to go equally well both ways? The first answer is ready—it is this, that the vessel cannot be made to go only one way—seeing that, in one case, she would have a best possible bow and a best possible stern, and in the other case could have neither. The next point is this; that, in both cases of bow and stern, it was necessary to have a compromise. Each required to be in turn bow and stern,—this was accomplished in the following manner:—If there be any point which has more forcibly struck me in the application of the wave principle than another, it is the flexibility of the wave principle,—the extent to which it admits of deviations from its strict rules without losing the benefit of its assistance. If it had unluckily been true of this system, that it prescribed an exact mathematical solid in its three dimensions, (like Newton's Solid of least Resistance,) to which implicit adherence was imperative on pain

* From the London Civil Engineer and Architect's Journal, for November, 1849.

of losing all the benefit proffered, then, indeed, the system would have been (like Newton's) of little use, from the fact that, from causes independent of resistance, ships cannot be solids of revolution, consistently with other qualities. The wave principle, on the contrary, possesses wonderful flexibility; first, from the circumstance of its prescribing lines *in one plane* only, and so leaving the other two dimensions in the hands of the practical constructor,—so that the sections of the vessel in one plane being given by the system, the sections in two others are at the service of the constructor. I had, in this case, to lay down for both ends of the vessel, that which is best for a bow and that which is best for a stern, at the given velocity. I had next to place relative values on bow resistance and stern resistance. I had next to single out from between those two lines one which, taken either as bow or stern, would deviate least from either, and so have least resistance on a mean of both directions. This, therefore, the wave principle did;—it gave the limits, and gave also the choice of a series of means, all more or less suited to the purpose intended. I have now shortly to state the practical details by which this process was carried into effect, and the results arrived at in consequence.

The engines of the vessel, as well as the vessel, had to be constructed by my partner, Mr. A. Robinson, and myself, and we were enabled to adapt the one to the other with greater ease and certainty than in all likelihood we could have done had the engineer been separate from the ship-builder. In our case, the engine was considered and made an actual portion of the ship, and the ship of the engine. It will be fair, therefore, to deduct from the good effects attributed to the wave form of the ship such advantages as we possessed in building both engines and boilers, and ship, as one whole;—still it is fair to remember, on the other side, that the builders of the engines with which ours had to compete, have been celebrated for their efficiency, and for the large actual power they have developed, when compared with their nominal power. It should also be remembered, that the builders opposed to us had previously built the fastest boats of their district. The results obtained are as follows:—Both vessels were about 150-55 feet long; 22-22½ feet beam; 4 feet draft of water; 240 tons displacement; 150-horse power, nominal; propelled by oscillating cylinders of 48 inches diameter, with the same proportion of stroke to paddle wheel in both cases; and with only such differences as the engineers and ship-builders in each case considered likely to be most successful in carrying out the execution of their work to the best advantage. The terms prescribed to both builders by the engineer of the proprietors being identical, and with only such latitude as should not form an obstacle to whatever might seem best suited for obtaining greatest efficiency.

Results of Experiments on Velocity with equal Power.

	Wave vessel.	Competing vessel.
Speed,	16.13	15.03 miles per hour.
Power,	20.30	19.90 velocity of wheel.
Loss,	4.17	4.87 slip of wheel.

These are the results of accurate trials, at the measured mile, made both with the tide and against it. It is important to observe the amount of slip, as it serves to show that it was no deficiency of the engine power which

caused the difference, both engines having gone at, as nearly as possible, the same speed. In order that the statement just given may not lead to false conclusions, it is necessary to state what where those minor differences in vessel and engine which each constructor adopted as tending to greater efficiency. The wave vessel had a flatter floor, and considerably squarer on the midship section, which was done for diminishing the depth of water as wanted for her use. In the other vessel, the consideration of draft of water was rejected or overlooked, and a finer midship section taken, although with a larger draft of water. In one case, also, the rudders were considered as part of the length of the vessel, and treated accordingly, and, in the other case, rejected from it. In the engines, also, although the diameters of the cylinders were identical, the stroke of the wave vessel was somewhat longer than the other, but the diminished effective diameter in the shorter stroke reduced them to nearly the same proportion. Thus far, the experiments given only serve to prove that, practically, a considerably better result has been obtained by a steam vessel built on the wave principle, than a competitor built under conditions that are perfectly identical, in so far as the public and the owners are concerned. But as regards the purely scientific question, I shall add two other experiments with the wave vessel, which furnish data of a more permanent and precise nature—one at a higher, the other at a lower velocity:—

Experiments on the Wave Vessel.

I. Velocity of vessel, 15.14 miles an hour.	II. Velocity of vessel, 16.50 miles an hour.
" of wheel, 18.17 "	" of wheel, 21.20 "
Slip, 3.03	Slip, 4.70
The area of midship section immersed was 89.4 feet.	
The surface of vessel immersed was 3080.0 feet.	
The area of paddle floats was 26.8 feet.	

The conclusion which I deduce from these last experiments is this, that, by means of the wave form, one may obtain a form of which the resistance shall be represented by $R = \frac{1}{20} A H S$, instead of $R = \frac{1}{6} A H S$, which is the lowest number given in any previous system of construction;— A , being the area of midship section, H , the height due to the velocity of the vessel, and S , the weight of a cubic foot of water.—*Proc. Brit. Assoc.*

*Improvements in Fixed and Revolving Lights, being a New Dia-Catoptric Instrument for Increasing the Intensity of the Light. By THOMAS STEVENSON, ESQ., F. R. S. E., C. E.**

The author stated that this instrument is composed of three parts—a paraboloidal mirror, having the conoidal portion behind the parameter cut off, and its place supplied by a hemispherical reflector, whose centre thus coincides with the focus of the paraboloid, while in front of the flame is placed an annular lens subtending at the focus of the paraboloid, the same angle as that which is subtended at that point by the greatest double ordinate of the reflector, and having its principal focus coincident with that of the paraboloid. This instrument should theoretically produce the most in-

* From the London Civil Engineer and Architect's Journal, for November, 1849.

tense light yet derived from any given flame, as it encloses and parallelizes each ray of the whole sphere of light, so that none are lost by divergence between the lips of the reflector, where, in the present arrangement, not very much short of one-half of the light is lost.

In this instrument, the hemispherical reflector throws the light which it receives (*viz.*, the posterior half of the sphere of light) through the focus of the paraboloid, and while the outer ring of this light is received by the paraboloid, and parallelized by it, the central cone is received by the annular lens, and is also parallelized. The outer ring of the anterior half of the sphere of light is received directly by the paraboloid, and is parallelized by it; while the central cone of rays, which, in the present arrangement, is lost by natural divergence, is received by the annular lens, and is parallelized by it. Thus the whole sphere of light is economized. This combination may also be applied *mutatis mutandis* to the illumination of half of the horizon of a fixed light, by means of a single light: the only difference being the substitution of two truncated parabolic conoids for the paraboloid, and a refracting belt for the lens. Two of these instruments directed to opposite points of the compass would light up the whole horizon.

Another new form of lighthouse apparatus was also described, by which the whole sphere of rays can be parallelized by means of a hemispherical reflector placed behind the light, and an annular lens, and a series of concentric totally-reflecting glass zones, also placed in front, and receding from the lens back to the reflector. These zones are also new in themselves, as they have the property of parallelizing divergent rays, not only in a vertical plane, like the zones in Fresnel's fixed lights, but also in every plane whatever.—*Proc. Roy. Scot. Soc. Arts.*

Extracts from the Annual Report of the Board of Canal Commissioners of Pennsylvania, for the fiscal year ending Nov. 30, 1849.

The Board of Canal Commissioners submit the following report of the operations on the several lines of canal and railroad of the Commonwealth, for the year ending the 30th of November, 1849.

The receipts and expenditures were as follow:—

RECEIPTS.

For motive power charges, and for the use of State trucks on the Philadelphia and Columbia railroad, including fines and old materials sold,	\$291,759·36	
For tolls on the Philadelphia and Columbia RR.	290,991·01	\$582,750·37
For motive power charges, and for use of State trucks on the Allegheny Portage railroad, including fines and old materials sold,	166,453·93	
For tolls on the Allegheny Portage railroad,	54,012·63	220,466·56
For tolls on main line of canal, including collections at outlet locks, bridges, and aqueducts; also, rents, fines, and old materials sold,	443,324·58	
Carried forward,		1,246,541·51

Brought forward,	\$1,246,541·51
Deduct drawbacks,	279·46
Total gross receipts on main line,	1,246,262·05
For tolls and fines on Delaware division,	196,714·24
For tolls, rents, and fines on the Susquehanna and North and West branches,	190,301·43
Total gross receipts on all the lines,	1,633,277·72

EXPENDITURES.

For maintaining motive power on the Philadelphia and Columbia railroad, including repairs and management of trucks, and purchase of two new engines from motive power fund,	\$191,368·14	
For purchase of two new engines from special appropriation, per act of 10th April, 1849,	16,400·00	
For repairs of Philadelphia and Columbia RR.	76,771·14	
For collectors, weigh masters, inspectors, and incidental expenses of their offices,	10,316·58	294,855·86
For maintaining motive power on the Allegheny Portage railroad, including the repair and management of State trucks, and the purchase of two new boilers, two new engines, and two passenger cars,	171,029·15	
For repairs on Allegheny Portage railroad,	45,664·70	
For repairing damage by explosion at plane No. 10,	3,012·69	
For collectors, weigh-masters, inspectors, &c.,	2,956·57	222,663·11
For ordinary repairs and breaches on main line of canal,	111,878·67	
For collectors, weigh-masters, inspectors, &c.,	15,637·00	
For lock-keepers,	25,394·00	152,909·67
For repairs and breaches on Delaware division,	23,010·45	
For collectors, weigh-masters, inspectors, &c.,	4,014·78	
For lock-keepers,	5,492·97	32,518·20
For repairs on Susquehanna division,	6,768·11	
For repairs on West Branch division,	24,702·35	
For repairs on North Branch division,	13,000·00	
For collectors, weigh-masters, inspectors, &c.,	5,665·57	
For lock-keepers,	5,418·00	55,554·03
Total expenses,	758,500·87	
Gross receipts,	1,633,277·72	
Net receipts over expenses,	874,776·85	

The pay of the Canal Commissioners, Secretary, Messenger, and incidental expenses of their office, amounting to 5179 dollars and 29 cents, and the cost of repairing farm and road bridges, under a special appropriation, amounting to 5000 dollars, are not included in the foregoing statement of expenditures. If these two sums be added to that account, the net revenue of the Commonwealth from the public works will be 864,597 dollars and 56 cents, being an increase over the net revenue of 1848, of 383,791 dollars and 10 cents. This increase is, in fact, much greater, if the large amount of debts not included in the reported expenditures for 1848 be added to the cost of repairs for that year. The increase in the gross receipts of tolls over 1848, is 79,933 dollars and 72 cents.

A more favorable result would have been obtained, but for the prevalence of the epidemic with which the various sections of the Union were visited during the year, and the extremely low water in the Western division of the canal, and in the Ohio river, which continued for near three months. The loss of revenue from these causes is estimated at 100,000 dollars. The diminution in the receipts from tolls, caused by the low water in the upper levels of the Western division, which would have been obviated by the completion of the reservoir on the western side of the Allegheny mountain, amounted to a much larger sum than the cost of finishing that structure. For a more extended view of this evil, from which the transportation business and the public revenues have been suffering for years, the Legislature is respectfully referred to the remarks under the proper head.

As has been before stated, the expenditures for all purposes for the year 1849, were 758,500 dollars and 87 cents. It is proper, however, to observe that, in this sum, is included 52,500 dollars, paid for six new locomotive engines, two passenger cars, and a new weigh scale at Philadelphia. These expenditures have been usually considered as additions to the permanent stock of the railroads, and not properly chargeable to the expenses of the year in which they were purchased. If these items had been deducted the present year, it would have made the expenditures 706,000 dollars and 87 cents, and the net receipts 927,276 dollars and 85 cents.

Every effort has been made, and the Board believe with success, to include in the foregoing table of expenditures every dollar of cost, whether paid or unpaid, for all the various branches of the service, so as to prevent the expenditures of one year being mixed up with those of the next. It will be seen from that table that the cost of repairs of the canals and railroads for the fiscal year amounted to 304,795 dollars and 42 cents, being an excess over the aggregate appropriation made by the Act of the 10th of April last, of 18,395 dollars and 42 cents. In this amount, however, is included the sum of 6599 dollars and 7 cents, for breaches and other casualties. The amount of indebtedness for repairs for the year, beyond the appropriation, and which is included in the table of expenditures, is 25,203 dollars. The apparent discrepancy between this sum and the excess of the cost of repairs over the estimates, is accounted for by the fact that the specific appropriations for several of the divisions were more than sufficient, and that these balances revert to the Treasury proper.

Statement showing the Comparative Cost of Running First and Second Class Locomotives on the Philadelphia and Columbia Railway.

One first class locomotive will haul, with ease, thirty-five cars at the following cost:

Cost of locomotive, \$8200—10 per cent. wear	
and tear,	\$820·00
“ “ 6 “ interest,	492·00
	<hr/>
	1312·00

per annum, or at three hundred and ten working days,	\$4·23 per day.
Engineer \$2 per day, fireman \$1·25, .	3·25 “
Sperm oil, four pints, at \$1·20 per gallon, .	60 “
Rags, three pounds, at five cents per pound, .	15 “
Wood, two and seven-eighths cords, at \$3 per cord, .	8·62 “
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Cost of locomotive per day, hauling thirty-five cars, at	
48½ cents per car, .	16·85
	<hr/>

One second class locomotive will haul only twenty cars, and will cost as follows:

Cost of locomotive \$7000—10 per cent. wear	
and tear,	\$700·00
“ “ 6 “ interest,	420·00
	<hr/>
	1120·00

per annum, or at three hundred and ten working days,	\$3·62 per day.
Engineer \$2, fireman \$1·25 per day, .	3·25 “
Sperm oil, three pints, at \$1·20 per gallon, .	45 “
Rags, two pounds, at five cents per pound, .	10 “
Wood, two and one-half cords, at \$3 per cord, .	7·50 “
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Cost of locomotive per day, hauling twenty cars, or 74⅔	
cents per car, .	14·92
	<hr/>

120,000 cars per annum, carried in trains of 35 cars each	
would give	3428⅔ trips.
Same number of cars, hauled in trains of 20 cars each,	
would give	6000 “
	<hr/>
Saving,	2571⅓ “
	<hr/>

2571⅓ trips per annum, at \$16·85 each, would be .	\$57,771·43
6000 “ “ 15·00 “ “ .	90,000·00
	<hr/>
Saving,	32,228·57
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In pursuance of the act of the 10th April, 1849, entitled “An Act to provide for the ordinary expenses of government,” &c., the Board, on the

24th of May last, appointed Edward F. Gay, Esq., engineer, to survey a route for a railway to avoid the Schuylkill inclined plane, and to report whether such a road could be constructed within the restrictions of the appropriations and grades prescribed by said act. The result of the survey being entirely satisfactory to the Board, the Executive was informed by them that the road could be completed within the terms of the act of the Legislature. Upon official information being received from that department, that the loan had been taken, proposals were immediately invited, and the grading and masonry allotted in the early part of August last, at prices much below the estimate of the engineer. The grading is progressing as fast as is desired, and it is contemplated that the entire road will be completed for use by the first of July next. By the accompanying report of the engineer, it will be seen that this road commences "near the ninth mile post on the Columbia railway, and about two miles east of Whitehall station. The line is located on the route and upon the bed of the old West Philadelphia railway as far as Hestonville, a distance of four and three-eighths miles; and thence, diverging from that road, it pursues nearly a direct course to the quarries at the west end of Fairmount dam; the line here curves gently to the right until it reaches the Blockley turnpike, or Haverford street, in Mantua village; and thence pursues a straight course, passing in the rear of Harding's hotel, and through Powelton, to a point near the borough line of West Philadelphia,—whence, curving on a radius of fifteen hundred feet, it passes through property belonging to the City of Philadelphia, and terminates at the west end of Market street bridge; distance from Hestonville three miles and sixteen chains, making the whole length of the road seven and five-eighths miles, nearly. The extension of the road to Broad street, a distance of seventy-four chains, and the construction of a bridge across the Schuylkill, has been undertaken by the city authorities, and are to be finished for use on or before the 15th day of July next. It is expected, however, that the work will be so far advanced towards completion as to allow the passage of cars by the 1st of July. The total distance by the new road, from its western terminus to Broad street, is eight and one-half miles, being fifty-six chains less than by the present route."

The following are the grades of the new road, commencing at its intersection with the old, viz:

	6 chains,		Level.
2 miles and 16	"	.	45 feet per mile.
2 "	74	" .	50 " "
	40	" .	23 $\frac{5}{8}$ " "
	70	" .	44 " "
	40	" .	40 " "
	20	" .	20 " "
	20	" .	10 " "

The total fall overcome is three hundred and twenty-six feet, equal to an average grade of about forty and eight-tenths feet per mile.

The following is the engineer's estimate of the cost of the road, "predicated chiefly on the contract prices, and in cases where the work is not

under contract, allowances having been made sufficient to ensure its completion," viz:

Grading and masonry,	\$147,195
Double tracks and sideings,	152,700
Depôt, collector's office, weigh-scales, &c.,	30,000
Damages, fencing, and roads,	27,000
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	356,895
Contingent and unforeseen expenses, 5 per cent.,	17,844
	<hr/>
Total,	374,739

If this estimate prove correct, and it is believed to have been made up with much care, there will be a surplus left of about twenty-five thousand dollars, which the Board, in a former part of this report, recommend to be appropriated, with other funds, to the improvement of the Columbia railroad.

A contract for the iron rail of this new road has been entered into with the proprietors of the Montour and Phoenixville rolling mills. It is to weigh sixty pounds to the yard, and is to be delivered at either terminus, at fifty dollars per ton. The Board, after due deliberation, felt satisfied that this contract, even in an economical point of view, was the best that could be made for the interests of the State. It is believed that the quality of the iron manufactured at these establishments will render its use cheaper in the end than that recently imported from foreign countries at a less price per ton.

AMERICAN PATENTS.

List of American Patents which issued in the Month of June, 1849, with Exemplifications by CHARLES M. KELLER, late Chief Examiner in the U. S. Patent Office.

1. For an *Improvement in Brakes for Carriages*; Gideon Griest, Adams county, Pennsylvania, June 5.

The patentee says,—“My improvement relates to a combination of levers and rods, connected with the hounds and futchels, sliding rubber bar, and sliding bar, and stops, for the purpose of changing the position of the fulcrum of the levers attached to the rubber bar, as the rubbers wear, in order to keep the rubbers at an uniform distance from the peripheries of the wheels. Also, in attaching the sway bar bolt to the sliding rod, and making an oblong opening or slot of sufficient length, in the ordinary tongue, to allow it to play back and forth, simultaneously with the forward and back movements of the rubbers, for preventing the sway bar striking the horses during the operation of the retarding apparatus, and the sudden advance of the carriage or wagon. And also, for throwing back the rubbers from the wheels, by the forward movement of the horses drawing forward the sway bar, and the sliding rod attached thereto, causing the levers to be reversed.

Likewise, in attaching to the tongue an apparatus for locking the sliding rod to it, so as to prevent the action of the retarding apparatus at pleasure."

Claim.—"What I claim as my invention, is, 1st, the combination of the levers P P with the levers L L, rods, bar, sliding rod, and rubbers, arranged and operated substantially as above described, and for the purpose set forth."

2. For *Improvements in Cockeyes for Harness*; Fowler P. Taylor, assignee of Joseph W. Briggs, Cleveland, Ohio, June 5.

Claim.—"What I claim as new, is the combination of the loop of the trace with a sectional cross-piece and a cockeye, whereby the trace is secured to a swivel cockeye without impairing its strength, and all the metallic parts are adapted to being made of cast metal."

3. For an *Improvement in Extension Machines for Raising Bricks, Mortar, &c.*; Jacob and John Pringle, Cambria county, assignees of James Cox, Ebensburg, Cambria county, Pennsylvania, June 5.

Claim.—"I claim combining the two series of extension frames, substantially as described, so that one may act as a counterpoise to the other when in use, and that, when out of use, the two frames may be brought down upon a level, for convenience of transportation, and occupy but little room; and also, that the relative height of the series may be adjusted for the purpose and in the manner described, or by any analogous mechanical devices."

4. For an *Improvement in Making Ivory Fine Tooth Combs*; Fenner Bush and Julius H. Pratt, Meriden, New Haven county, Connecticut, June 5.

Claim.—"What we claim as our invention, is the constructing a comb of four pieces of ivory or other material, united substantially in the manner set forth, to wit, two comb plates, having their inner edges bevelled off and joined to each other by means of the two strips placed opposite to each other, over the bevelled edges of the plates, and connected by a row of rivets passing through the centres of the strips, and through the bevelled edge of each comb plate, as described."

5. For an *Improved Railroad Turnout*; Carlton Dutton, Rochester, New York, June 5.

Claim.—"What I claim as my invention, is the combination of the switch rails with the frog latch, in such a manner that the frog latch is forced to move simultaneously with the switch rails, by means of a series of rods and levers, arranged and connected as described."

6. For an *Improvement in Bee Hives*; Arza Gilmore, Wayne, Kennebeck county, Maine, June 5.

Claim.—"What I claim as my invention, is the employment of the slide door, in combination with the open galleries above and below the same,

for the purpose of separating or combining, at the will of the apiary, the several tiers of chambers as described and represented. I also claim the use of the dark chamber, with the passage out of the same through the main body of the working hives, for the purpose of domesticating wild or foreign bees, by compelling them, in leaving the dark chamber, to pass through or into the working chambers of the bee house."

7. For an *Improved Trap, and Method of Setting it*; Thomas A. Davis, City of New York, June 5.

Claim.—"What I claim as my invention, is the combination of the hook, the straight bar to which it is attached by a pivot, and the spring; the whole arranged and acting as described, by which I am enabled to set the trap without a catch or lock of any kind."

8. For *Improved Tent Frames*; Jesse E. Dow, Washington City, D. C., June 5.

The patentee says,—“The nature of my invention consists in constructing a tent without a centre pole, or any ropes, pins, or other similar device, by which the whole interior of the tent is free, and the tent can be pitched or struck in much less time than the ordinary one, while it is capable of standing in any soil with greater security, is impervious to water, and is perfectly ventilated.”

Claim.—“What I claim as new, is the constructing a tent substantially in the manner described, with a series of poles jointed together at the centre, and having spade-formed feet, by which it is anchored to the ground without pins and other fastenings, as set forth.”

9. For an *Improvement in Grain Drills*; Edward Steacy, Strasburgh, Lancaster county, Pennsylvania, June 5.

Claim.—“What I claim as my invention, is shifting the hoppers back and forward with couplings and levers, as set forth, to continue or stop the seeding, in combination with the shaker, having movable dies therein, for regulating the quantity of seed and distributing the same, and moved as described.”

10. For an *Improvement in Windmills*; Charles B. Hutchinson, Waterloo, Seneca county, New York, June 5.

The patentee says,—“The nature of my invention and improvement consists in securing to a vertical shaft, arranged within a suitable frame, and resting on a step at the lower part of the same, a series of radial arms, curved near their outer extremities, where they are secured to a ring or rim, and having vertical shafts fastened to their curved parts, provided with pulleys above and below, around which pass bands or cords extending over similar pulleys attached to the main revolving shaft, and fastened at each end to a rising and falling button or ring, connected by a rod to a similar ring or button near the lower part of the shaft, within reach of the operator; said cords or bands being also attached to other bands or cords

passing over pulleys at the upper ends of the rods, and secured to the upper end of triangular sails at one end, and wound round a series of vibrating rollers at the other; and also in providing the wheel with a governor; the whole being constructed, arranged, and operated in such a manner as to cause the wind to act on all the sails more or less at one and the same time, and to regulate the speed of the wheel without the assistance of the operator, and to enable him to lower the sails from below, and thus stop the motion of the wheel when desired."

Claim.—"What I claim as my invention, is the combination of the curved bars, connected to the radial arms by hinged plates or bars, connecting bars, hubs, connected together by a rod, forked lever and governor, for regulating the speed of the wheel, in the manner described.

"I likewise claim the mode of raising and lowering the sails, when desired, by means of the bands or cords *L*, attached to the hub *K*, connected to the hub *r*, below, by the rod *s*, passing over the pulleys *t u v w*, and attached in their course, at the point *x*, to the cords *p*, passing over the pulleys *g*, and secured to the peaks of the sails, and the worm or screw pulleys *d*, on the rollers *D*, as set forth."

11. For an *Improvement in Parlor Cooking Stoves*; Edward R. Brown, Albany, New York, June 5.

Claim.—"I claim the employment of a double top plate, constructed as described, the upper part of which is whole and is removable at pleasure, while the lower portion is furnished with apertures for boiler holes, which are covered with ordinary covers, as set forth, both parts of the double top being made the full size of the stove."

12. For an *Improvement in Pumps*; Downs, Mynderse & Co., assignees of Birdsill Holly, Seneca Falls, Seneca county, New York, June 5.

Claim.—"What I claim as my invention, is the combination of the nozzle with the pump barrel, in such a manner that the nozzle can be readily changed from side to side, and secured in any desired position, substantially as described and represented."

13. For an *Improvement in Corn Ploughs*; Stephen Coats, La Fayette, Walworth county, Wisconsin, June 5.

Claim.—"What I claim as my invention, is the auxiliary cultivator teeth in the outer ends of the drag, as described."

14. For an *Improvement in Metallic Alloys*; Herman B. Babcock, City of New York, June 5.

Claim.—"What I claim as my invention and discovery, is the composition, as described, composed of zinc and iron, combined with each other when in a fused state, and the application and use of said composition to the purposes specified, and to any other useful purpose to which it may be applied."

15. For an *Improvement in the Consumption of Fuel in Steam Boiler and other Furnaces*; Christian Burckhardt, Cincinnati, Ohio, June 5.

The patentee says,—“The nature of my invention consists in applying decomposed steam, at a high temperature, to the products of combustion above the coal or other fuel, together with a due proportion of atmospheric air, the whole of which commingle, and by which all the combustible matter in the fuel is consumed.”

Claim.—“What I claim as new, is the employment, arrangement, and combination of apparatus, constructed substantially as described, for consuming the gases arising from ignited fuel, by the introduction of decomposed steam, or the gases resulting therefrom, and atmospheric air in a highly heated state, over fire. I also claim the revolving grate, constructed and operating as described.”

16. For an *Improvement in Seed Planters*; James D. Willoughby, Chambersburg, Franklin county, Pennsylvania, June 5.

Claim.—“What I claim as new, is, 1st, the manner of guiding the machine by changing the position of the tongue, substantially in the manner set forth.

“2d, The combination, substantially as described, of the lever and link with the beam and tooth, for the purpose of drawing back the point of the tooth at the same time the beam is raised, whereby the tooth is easily kept clear of sods, roots, and other obstructions, and the danger of its getting broken diminished.”

17. For an *Improvement in Smut Machines*; Joseph Hëygel, Cumberland, Alleghany county, Maryland, June 5.

The patentee says,—“The nature of my improvement consists in the combination of two rubbing surfaces of India rubber, and rubbing surface of India rubber with cast iron, to clean the wheat from smut and garlic.”

Claim.—“What I claim as new, is the combination with each other of the inclined and horizontal runners, and constructed substantially as set forth, for the purpose of more perfectly separating smut and garlic from wheat.”

18. For an *Improvement in Sun Dials*; James Scott, Portland, Cumberland county, Maine, June 5.

The patentee says,—“My invention consists in combining with the gnomon a small pin wire or shadow indicator, and a scale, to indicate, by means of the shadow of such a pin or indicator, the month and day of the month; whereby the dial may not only be made to indicate the time of the day, but also the day of the year: that is to say the month and day of the month.”

Claim.—“What I claim as my invention, is the shadow indicator or pin, and declination scale, or scale of months and days, in combination with the gnomon, substantially in the manner and for the purpose as specified.”

19. For an *Improved Steering Apparatus*; Jesse Reed, Marshfield, Plymouth county, Massachusetts, June 5.

The patentee says,—“The essential and distinguishing feature of my newly invented steering wheel is a revolving right and left-threaded screw, working two half nuts on opposite sides of said screw, said nuts being connected to the two sides of the rudder head; and as the nuts move always in opposite directions, on opposite sides of said revolving screw, they both tend to give the rudder a rotary motion in the same direction.”

Claim.—“What I claim as my invention, is the combination of a right and left-threaded screw, on the hand wheel shaft, with two half nuts, arranged one on each side of said screw, and traversing in guides opposite to each other, as herein above set forth, said nuts being connected to the rudder head, either by the long arms, as in the first described arrangement, or as in the second, by the slotted arms and sliding buttons, all arranged and operating substantially as set forth.”

20. For an *Improvement in Subsoil Corn Ploughs*; Henry Bacon, Tecumseh, Lenawee county, Michigan, June 5.

Claim.—“What I claim as my invention, is the construction of my subsoil plough shares, in combination with the small ploughs fastened above them on the same standards, and having a space between them, in the manner and for the purpose described ”

21. For an *Improved Shank Painter-Stopper*; Charles Perley and Joshua Terry, City of New York, June 5.

Claim.—“We claim as new and of our invention, the application, arrangement, and combination of the parts described and shown, by which the lock piece, with ears or shoulders, places any ultimate strain upon the fixed fillets, and, through the lug and pin, secures all the operative parts from moving by accidental causes, at the same time providing means, through the attached chain, by which one man can release or ‘let go’ the anchor without other manual help, and without other mechanical aid than that furnished by the parts attached and employed, when constructed and combined substantially in the manner described.”

22. For *Chills for Casting Rasps, Files, &c.*; Ezra Ripley, Troy, Rensselaer county, New York, June 5.

The patentee says,—“The nature of my invention consists in constructing the die of strips of metal, in such a manner as to ventilate the die and mould, so as to allow the metal to run freely and fill the teeth to a degree of point and sharpness not heretofore attained in casting iron.”

Claim.—“What I claim as my invention, is the method described of casting floats, rasps, graters, &c., by means of a series of chill dies, constructed and used as herein described, the essential in the construction of such chills being that there is one piece for every series of teeth, and that the latter are cast in indentations formed between the chills, the same being formed substantially in the manner and for the purpose set forth.”

23. For an *Improvement in Cultivators*; George W. Brown, Tylersville, Warren county, Illinois, June 5.

The patentee says,—“The nature of my invention and improvement consists in so arranging the several parts of the cultivator that the shovels can be extended or closed, for the purpose of ploughing between wide and narrow rows, or adjusted in regard to their angle of inclination, so as to throw the earth towards or from the rows at pleasure, by simply moving two short side adjustive beams to which the shovels are affixed, which is effected by means of a combination of levers and connecting links.”

Claim.—“What I claim as my invention, is the mode of adjusting the position of the shovels, so as to throw the earth from or towards the rows of corn, or to the right or left at pleasure, by means of the before described combination of the levers, links, and adjustive bars, with the parallel slotted bars and oblique hinged bars, as described.”

24. For an *Improvement in Shoulder Braces*; Samuel S. Fitch, City of New York, June 5.

Claim.—“What is claimed as my invention, is the employment of the metallic coiled spring, with one or more coils, in combination with shoulder straps, with or without eyelet holes and lace, tugs, and pads, substantially as and for the purposes described.”

25. For *Machinery for Operating Railroad Gates by Means of the Locomotive*; Richard Coffin, West Haverhill, Essex county, Massachusetts, June 5.

The patentee says,—“The nature of my invention consists in constructing and arranging a gate, and the operating apparatus in connexion therewith, designed to close up the common road at the time the engine or train crosses it, and which shall open and shut of itself, through the action of the locomotive, when it passes by the crossing of a common road where the said gate is erected.”

Claim.—“I claim the vibrating cam levers attached to the bars, in combination with the cam block and the spring L, and the rope or chain passing over the pulley, and the spring K, for the purpose of opening and closing the gate by the action of the projecting bar of the locomotive upon the vibrating levers, in the manner substantially as described.”

26. For an *Improved Gun Lock*; William W. Marston, City of New York, June 5.

The patentee says,—“The nature of my invention consists in giving to the fulcrum of the trigger an adjustable facility, by which the seer of the same may retract or return to its position back of the arm, answering to the tumbler after having been operated, independent and without the use of the ordinary intervening trigger catch or dog, common to most of gun locks.”

Claim.—“What I claim as new, is the adjustable slot in the centre hole and fulcrum of the trigger, acting in direct combination with the spring D,

and also in combination with the arm of the hammer and the main spring, substantially as described."

27. For *Improvements in the Boom Derrick*; George E. Warner, Springfield, Hampden county, Massachusetts, June 5.

The patentee says,—“The nature of my invention consists of a combination and arrangement of machinery for raising bricks, mortar, and other building materials for buildings in the process of erection, whereby is effected a great economy of time and labor in the operation, as compared with the ordinary modes of performing the work.”

Claim.—“What I claim as new, is the drum, as constructed with its inner shaft, with its arrangement for giving independent motion, by means of which the ropes can be housed and protected, in combination with the adjustable rotary cross beam, arranged and operated as described, by means of which combination and arrangement I am enabled to have in wear only such portions of the ropes as the operation of the machine and the varying elevation of the wall or structure may demand.”

28. For an *Improvement in Seed Planters*; David Deihl, Hanover, York county, Pennsylvania, June 12.

Claim.—“What I claim as my invention and improvement, is, 1st, the combination of the roller, springs, and lever, with the rack to which the cultivator teeth are affixed, for regulating the depth of furrowing in various kinds of hard or mellow soil, without the necessity of altering the position of the transverse beams to which the rear ends of the parallel longitudinal beams are connected.

“2d, I also claim the manner of preventing the seed passing from the hopper through the channels of the planting cylinder, when the cultivator teeth are raised from the ground, or whenever it is desired to stop the planting operation, by means of the combination of the transverse rising and falling bar, cams, bent rods, sliding bar, valve rods, and springs, with the frame, as described.

“3d, I likewise claim placing the radial pins in the channels of the planting cylinders, in the manner and for the purpose set forth.”

29. For an *Improvement in Harvesters*; Nelson Platt, Ottawa, LaSalle county, Illinois, June 12.

Claim.—“What I claim as my invention, is the combination of a series of removable cutters with the links of an endless revolving chain, which carries them successively into contact with the grass or grain to be cut, substantially as described, whether the cutters be contiguous or placed at intervals upon the chain.

“I also claim making one end of each cutter sharp, in order that, by pressing against the adjacent end of the next cutter, straw, grass, or other intervening obstructions, may be cut in two and pass out, the cutters thus freeing themselves from obstructions which might otherwise choke or break them.

“I also claim placing the bundles or sheaves of grain at right angles to

the path of the machine, by means of a second rake combined with the first, substantially as herein set forth.

"I also claim moving or turning the first rake by cords, chains, or belts, arranged and operated as described, or in any other substantially similar manner.

"I also claim vibrating the second rake and turning its teeth, as set forth, whether the devices employed to effect these movements be such as described, or others equivalent thereto.

"I also claim changing the frequency of the alternations of the rakes, by means of the cones of wheels and pinions, or other equivalent device, for the purpose of varying the size of the sheaves, as set forth."

30. For an *Improvement in Harness Saddles*; Joseph W. Briggs, Cleveland, Ohio, June 12.

Claim.—"What I claim as new, is disconnecting the pads from the skirt and girth, when the pads are hinged to, and placed far enough beneath, the tree to admit of free motion to conform to the shape and changing positions of the horse's back, without coming into contact with the skirts or girth which are attached to the tree, as set forth."

31. For an *Improvement in Steam Pipes for Sugar Boiling*; Alfred Stillman, City of New York, June 12.

Claim.—"What I claim as my invention, is connecting the two compartments of the main steam pipe of the evaporating tubes of evaporating pans, by means of a series of syphon tubes, which receive the steam from one compartment and discharge it into the lower compartment, whereby I am enabled to obtain a larger amount of heating surface than by any other known plan."

32. For an *Improvement in Drill Barrows*; George Colby, Fayetteville, Franklin county, Pennsylvania, June 12.

The patentee says,—"My invention consists in a peculiar arrangement of adjustable cams, to regulate the frequency with which the seed is deposited, and in giving to a combined slide and agitator, which admits the seed from the hopper into the discharger, a double motion, whereby the discharge of the seed is rendered more regular and certain."

Claim.—"What I claim as my invention, is the combination of the upper slide with the lower, the former moving at least twice for one movement of the latter; the two being made and arranged in the manner and for the purpose as set forth."

33. For *Improvements in Machines for Cutting Out Felloes*; Joseph and Levi Adams, Hadley, Hampshire county, and Luther H. Moore, Levere'tt, Franklin county, Massachusetts, June 12.

The patentees say,—The nature of this invention and improvement consists in securing to the upper end of a vertical shaft, turning in boxes in a suitable frame, a horizontal beam having adjustable cutters attached

near its extremities, at the required relative distance from the centre of the shaft to correspond with the inner and outer curvature of the felloe to be cut, and causing said cutters to revolve over the timber from which the felloes are to be cut, and gradually descend during their revolutions, by means of bands, pulleys, friction wheels, screw shaft, levers, &c., and cut the felloe, and, by means of the movement of a lever, to reverse the movement of the screw shaft, and cause the cutters to ascend to their original positions, to allow the operator to bring the timber forward for another cut."

Claim.—"What we claim as our invention, is the combination of the cutter head and beam with the levers *G j*; cross head moving between upright slides, and attached to the lever *j* by the connecting rod, iron straps, and oblong plate; screw shaft passing through the cross head, and provided with the friction wheel *o*, which is alternately thrown into gear with the friction wheels *f p*, on the upper ends of the shafts, by means of the horizontal beam, pulleys, and weights, and lever *w*, for elevating and depressing the cutter beam and cutters, in the manner and for the purposes herein set forth."

34. For an *Improved Pad Lock*; Francis C. Goffin and Conrad Liebrich, Philadelphia, Pennsylvania, June 12.

Claim.—"What we claim as our invention, is the main spring answering three distinct purposes, viz., throwing out the bow, holding back the bolt proper when unlocked, and forcing it forward in locking, its power increasing during the process of locking and unlocking, while it is perfectly at ease when unlocked; all of which is constructed and operates substantially in the manner herein above described."

35. For *Improvements in Barrel Machinery*; Reuben Murdock, Rochester, Monroe county, New York, June 12.

The patentee says,—"The object of my improved machinery is the production of a smooth stave, having both its cross and longitudinal sections correctly curved, and the edges correctly beveled and jointed, so as to fit it for the hoops."

Claim.—"What I claim as my invention, is, 1st, the combination of the revolving dogs, the pawls, the disengaging levers, the vibrating feed lever, and the stops, whereby the slab is secured on the carriage, and successive staves sawed from the same slab.

"2d, I claim disconnecting the carriage from the feed gear, during its retrograde motion, while the slab is being fed towards the saw, substantially in the manner and for the purpose set forth.

"3d, I likewise claim the combination of the oscillating saw, with the curved gated case, whereby the stave is securely held during the action of the saw, in the manner and for the purpose set forth.

"4th, I likewise claim the combination of the stave carriage with the spring dogs and spring holdfast and stop, whereby the stave is securely held down during the action of the saws, and then thrown from the machine.

"5th. I also claim the combination of the concave and convex pressure feed rollers, and the self-adjusting spring clamps or rests, with the concave and convex cutters, when the several members are arranged in the curve of the longitudinal section of the stave, as set forth."

36. For *Improvements in Trucks for Railroad Cars*; Isaac Knight, Baltimore, Maryland, June 12.

The patentee says,—“The object of my invention is to dispense as much as possible with the conical form of the wheels, and at the same time to enable the cars to pass around the curves of the road with less friction and loss of power than upon any plan heretofore used or known; and also to enable cars of great capacity to be built upon a plan much more simple, cheap, and safe than heretofore.”

Claim.—“What I claim, is the connecting and combining, in the carriage for carrying burthens and passengers upon railroads, one or more intermediate pair of cylindrical wheels, or wheels nearly cylindrical, without flanches, loose upon their axles, or otherwise independent in their action, so that any one of these intermediate wheels may revolve faster or slower than the others, in connexion with guide wheels having one or two flanches, they being made fast to their axles; and also, either for a six or eight wheel car, all the wheels of the same carriage, both fast and loose on their axles, being attached to one and the same stiff frame by means of springs and bearing boxes, or otherwise. This combination in a railroad carriage, as above described, I claim as new and of my own invention; I do not, however, claim cylindrical wheels on separate frames, made fast to, and revolving with, their axles, these having been used in steam locomotive engines as drivers, but I do claim the loose or independent wheels without flanches, in connexion with guide wheels having flanches, and the attachment of the wheel to the one stiff frame, as above described.”

37. For an *Improved Construction of the Master Wheel of Horse Powers*; John A. Taplin, Fishkill, Dutchess county, New York, June 12.

The patentee says,—“The nature of my invention consists in giving the segments of the master wheel an \mathbf{I} cross section, the segments having greater depth than width, and having vertical cog teeth cast to their lower edges; and in connecting together the segments thus formed by two segmental rings of wrought iron, which are inserted in the opposite depressed sides of the cog segments. The segmental rings break joint with each other, and with the joints of the cog segments, and are secured to each other, and to the cog segments, by screw bolts passing transversely through the rim; the several parts, when combined, forming a rigid annular wheel, which will maintain its shape without the use of framing.”

Claim.—“What I claim as my invention, is making the rim of the master wheel of a horse power, within which the horse walks, of annular segments of cast iron, (the cogs being vertical and on the edge of the segment,) the inner and outer peripheries of which are grooved, and have segmental bands of wrought iron fitted therein, the wrought iron segments breaking joint with each other, and with the cogged segments, and the whole being

bound together by through bolts, thus making a portable rim wheel, sufficiently strong and rigid to maintain its form and perform its duty without the assistance of framing."

38. For an *Improvement in Corn Shellers*; Jacob Mumma, Middletown, Dauphin county, Pennsylvania, June 12.

The patentee says,—“The nature of my improvements consists principally in the peculiar formation of the runner, and its adaptation to the stationary breast beam, with spring blocks thereon, by which I am enabled to shell corn with greater facility and less labor than in the ordinary way; the peculiarity of the arrangement consists in so placing the inclined breast beam in juxtaposition with the runner, as to make every part of the straight line of the beam to approach the curved face of the runner at nearly the same distance at all points; the angular form of the rows of teeth, and the peculiar form of the runner, cause the corn to be raked off from end to end of the cob, which is supported on the permanent breast beam, and is caused to pass out of the machine with increased rapidity as it is shelled.”

Claim.—“What I claim as new, is the employment of a concave runner, by means of which the cobs are more freely discharged, armed with spiral rows of teeth or ribs, combined with the inclined breast beam and spring block, substantially in the manner and for the purpose set forth.”

39. For an *Improvement in Churns*; Chapman Warner, Louisville, Jefferson county, Kentucky, June 12.

Claim.—“What I claim as new, is making the moving parts of the churn, consisting of a vertical shaft and rotary dasher, constructed substantially as specified, to be suspended and combined with the movable lid, as described, thereby dispensing with a pivot or step at the lower end of the shaft for the purpose set forth, so that said moving parts can be readily lifted from the churn and again be replaced; the whole operating in the manner described.”

40. For an *Improvement in Musical Notation*; Ernest Von Heeringen, Pickensville, Pickens county, Alabama, June 12.

The patentee says,—“The first portion of my improvement is designed to enable beginners to acquire the fingering of any keyed instrument without numbering the notes on the score, as is usually done.

“The second portion of my improvement is in the method of counting the musical intervals or notes, taking the chromatic scale instead of the diatonic for my base.

“In the third portion of my improved method of notation, the exact sound of the note, whether sharp, flat, or natural, is shown by the musical characters themselves, without the assistance of chromatic signatures.”

Claim.—“What I claim as new, is, 1st, the arrangement of distinct characters, to denote the fingering of music, made and arranged substantially in the manner described.

“2d, Giving the twelve musical intervals distinct names, so that the use

of the words flat and sharp are entirely avoided, and with them, all the confusion naturally arising in the mind of a beginner.

"3d, Representing the sounds usually called natural by one uniform color, and those commonly called flats and sharps by another uniform color, so that they may be distinguished from each other by a mere inspection of the musical character representing the note, without the use of chromatic signatures."

41. For an *Improvement in Inhalers or Lung Protectors*; Lewis P. Haslett, Louisville, Jefferson county, Kentucky, June 12.

Claim.—"What I claim as my invention, is, 1st, the nose or mouth joint, having the piece made to fit the nostrils or the mouth, in combination with the valves, for the purpose of causing the air to enter and be discharged through separate orifices, as herein described.

"2d, In combination with said nose or mouth joint and valves, I claim the filterer, either with or without the tube, as described."

42. For an *Improvement in Cooking Stoves*; Jordan L. Mott, City of New York, June 12.

Claim.—"What I claim as my invention, is the method, substantially as described, of equalizing the heat in the oven, by combining with the diving flue at the back, and the series of tubular flues at the bottom with spaces between them, the return flue below the flue tubes and the return flue at the back of the diving flue, substantially as described.

"And I also claim the method of protecting the top plate of the stove, or the parts thereof, by lining it or them with a perforated plate or plates, with some earthy cement or other refractory substance interposed between the plate or plates and the perforated lining, as described."

43. For an *Improvement in Reed Musical Instruments*; B. F. Blodget and H. B. Horton, Akron, Summit county, Ohio, June 19.

The patentees say,—"The nature of our invention consists in converting the wind chest, in which the reeds are located, into a sounding chamber, by forming one side of the wind chests of a thin elastic sounding board, placed in near proximity to the reeds."

Claim.—"What we claim as our invention, is the converting the wind chest, in which the reeds are located, into an expansible sounding chamber, by forming one side of it (the said wind chest) of a thin elastic sounding board placed in sufficiently near proximity to the reeds; when this arrangement is combined with the location of the valves on the outside of the wind chest or sounding chamber, substantially in the manner and for the purpose set forth."

44. For *Improvements in Washing Machines*; Daniel L. Walker, Roxbury, Delaware county, New York, June 19.

Claim.—"I claim as my invention, the combination and arrangement of the front part of the box with its vertical flutings, and of the vibrating

fluted roller and pounders, for the purpose of turning the clothes with the supports, as described."

45. For an *Improved Sculling Propeller*; Alexander Bond, Philadelphia, Pennsylvania, June 19.

Claim.—"What I claim as my invention, is the propeller suspended by, and in combination with, the shafts *a a*, the levers, and the shafts *c c*, constructed and moving substantially in the manner described and for the purpose set forth."

46. For an *Improvement in Cooking Stoves*; Ebenezer F. Martin, Rockport, Essex county, Massachusetts, June 19.

Claim.—"What I claim as my invention, is the combination of the oven with the air space and fire chamber by means of the sliding doors, as specified, the same being for the purpose of either enabling a person to make use of the oven either for baking or roasting, as specified, or to make use of it for baking, while the roasting is done in a roasting apparatus set up against the opening, as explained."

47. For an *Improved Gold Washer*; William Ball, Chicopee, Hampden county, Massachusetts, June 19.

Claim.—"I claim, in combination with the mercury bath, a surrounding channel or groove, made to communicate therewith by a passage, and applied so as to intercept the mercury which may be thrown out from the bath, whereby the mercury thrown out is again returned to the central cistern without intervention on the part of the operator.

"And, in combination with the elements above claimed, I claim one or more concentric mercurial rings, arranged between it and the cistern or bath, the same not being made to communicate with the main vessel or bath by any passage; the same being for the purpose of intercepting the small escaped particles of mercury, and retaining them until so washed by the water that they will coalesce with the mercury contained in said ring or rings.

"And I claim the central tube, as well as its perforated water diffusor or tunnel, in combination with the main hollow shaft, its bell-mouth vessel or top, and perforated partition or separator; the whole being made to diffuse and apply the water to the auriferous earth and mercury bath, and prevent packing of it within the tube, essentially as specified."

48. For an *Improvement in Grain Drills*; Aaron Palmer, Brockport, Monroe county, New York, June 19.

Claim.—"What I claim as my invention, is the manner of connecting the planting tubes to the axle and seed box, substantially as represented and described, by which the person following after and attending the machine, is at all times enabled to witness its operation, and see that each tube deposits its proper quantity of grain or seeds in the drills, to wit: making use of pairs of parallel inclined bars, connected by hinge joints to

the tubes, and to the axle and seed box, with a groove formed in the lower bar of each pair, for conducting the grain or seeds from the seed box into the planting tube, to which it is jointed."

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49. For a *Rotating Tumbler Gun Lock*; Fred. Goodell, assignee of Thos. W. Harvey, City of New York, June 19.

Claim.—"What I claim as new, is the revolving tumbler, having a continuous rotating forward movement, by which the hammer is raised and allowed to escape through the intervention of a series of notches acting as cams on the arm of the hammer, substantially as described, and expressly as applied to gun locks. I also claim the said tumbler, as described and shown, in combination with the hammer, trigger, catch, and springs."

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50. For an *Improvement in Churns*; Geo. E. Gill and Jos. B. Tillinghast, Chillicothe, Ross county, Ohio, June 19.

The patentees say,—"The nature of our invention and improvement consists in a new combination and arrangement of known mechanical devices, whereby cream is churned by mixing a sufficient stream of atmospheric air with it, at the same time that it is subject to a high degree of agitation by a revolving dasher in the usual way."

Claim.—"What we claim as our improvement, is the introduction of double inclined stops, as described."

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51. For an *Improvement in Carding Machines*; John M'Carty, Somerset, Somerset county, Pennsylvania, June 19.

The patentee says,—"The nature of my improvements consists in the manner of banding the top rollers, thereby increasing their speed and regulating their motion, by which I economise power, and greatly increase the working effect of the carding machine."

Claim.—"What I claim as new, is banding the top rollers or workers to the main carding cylinder, substantially in the manner and for the purposes set forth."

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52. For an *Improvement in Carriers for Harvesting Machines*; J. J. & H. F. Mann, Clinton, Laport county, Indiana, June 19.

The patentees say,—"The nature of our invention consists in conveying the grain, after it is cut, from the reaping machine in bundles, in such a manner as to keep it straight, and discharge it from the machine without scattering, a difficulty heretofore found insurmountable by machinery, as, in all practical machines now employed, such as M'Cormick's and others, the grain has to be discharged by a rake by hand."

Claim.—"What we claim as new, is the employment, in combination, of a double series of endless bands, constructed and arranged substantially in the manner and for the purpose set forth, by which the grain is raked and carried over one side of the machine.

"And lastly, we claim the receiver, for collecting the grain into bundles and discharging it from the machine at once, in the manner made known."

53. For an *Improvement in Revolving Horizontal Coal Grates*; John F. Weishampel, Baltimore, Maryland, June 19.

Claim.—“All that I claim is, 1st, the combination and arrangement of the four segmental, hinged, and sliding doors, with the revolving grate, constructed, arranged, and operated in the manner and for the purpose set forth.

“2d, I claim the combination of the damper with the revolving grate, as described.

“3d, I claim the combination of the protuberance, on the inside of the case, with the case and doors of the grate, for closing the right hand doors as the grate is revolved.

“4th, I claim the combination of the double inclined plane with the case and the projections on the doors of the grate, for bolting the doors as the grate is turned.

“5th, I claim making the journals of the doors with shoulders on the upper and inner sides, by reducing the diameter of the journals, in the manner and for the purpose described.”

54. For an *Improvement in Seed Planters*; Edmund Myers, Union Mills, Carrol county, Maryland, June 19.

Claim.—“What I claim as new, is the combination of the teeth hinged on joint pins with the beams, and springs, substantially as described, whereby any of the teeth may turn aside, or rise over stones and other common obstructions which they may meet, thus greatly diminishing the danger of being broken, and of throwing the machine out of its track.”

55. For an *Improvement in Melodeons*; Charles Austin, Concord, Merrimack county, New Hampshire, June 19.

Claim.—“I claim my improved manner of arranging the reed with respect to the air passage or opening, as represented, and consisting in bending the thin end of the reed down below the bottom of the opening, substantially in manner, and so as to allow the air to operate on it, as explained.”

56. For an *Improvement in Atmospheric Churns*; Samuel P. Francisco, Reading, Berks county, Pennsylvania, June 19.

Claim.—“What I claim as my invention, is the tubulated disk dasher, surmounted by a hollow stem, for churning cream by agitating, and by admixing therewith the atmospheric air, and the gathering the butter (when separated) into large balls or rolls, as set forth.”

57. For an *Improvement in Winnowing Machines*; Benj. D. Saunders, Hollidayscove, Brooke county, Virginia, June 19.

The patentee says,—“The nature of this invention and improvement consists in conducting the grain through an inclined spout, and depositing the same on a sieve or screen enclosed in a vertical spout or trunk communicating with an ordinary fan, and, by producing a partial vacuum

above said grain, to cause the impurities to be drawn into the horizontal part of the trunk, where, by its superior gravity, it is caused to fall through an opening in the bottom of said horizontal part, while the chaff and dust, being too light to bear the draft of air, are drawn through the fan case, and discharged through the longitudinal trunk of the same to any point desired, thus effectually separating the two."

Claim.—"What I claim as my invention, is the trunk F, gradually enlarged from below upwards, and communicating with the atmospheric current through the screen, in combination with the hopper, and the fan placed at the end of the opposite vertical trunk D, to separate the chaff and other impurities from the grain, in the manner substantially as described."

58. For an *Improvement in Self-Regulating Dampers for Stoves*; Benson Owen, Seneca Falls, Seneca county, New York, June 19.

The patentee says,—"The nature of my improvements consists in the application of the lateral motion produced by the expansion and contraction of a metallic plate or flexible rod, fastened at both ends to a permanent support, and having a lever, acting upon a register, combined therewith, so as to avail myself of the greatest amount of motion, caused by the expansion of said plate, to act on said register."

Claim.—"What I claim as new, is the employment of an expanding flexible plate, firmly secured at both ends, in combination with, and acting upon, a pendulum lever valve, regulating the draft, substantially in the manner and for the purpose set forth."

59. For an *Improvement in Cooking Stoves*; Roswell Wilson, Albany, New York, June 19.

The patentee says,—"The nature of my invention consists in the arrangement of the plates, flues, and dampers of a cooking stove, in such a manner that the gaseous products of combustion may be conducted from the fire chamber to the smoke pipe by the various channels set forth."

Claim.—"What I claim as my invention, is the surrounding the oven with flue spaces, when the said flue spaces are arranged and combined with each other, and with the fire chamber and smoke pipe, by means of dampers, in the manner and for the purpose substantially as described."

60. For an *Improved Lever to be placed on a railroad track, and acted upon by the wheels of cars or locomotives*; L. B. Kelly and B. Harper, assignees of John W. Hoffman, Philadelphia, Pennsylvania, June 19.

Claim.—"What I claim as my invention, is the joint lever, constructed and operated substantially as described, and applied on railroads, for the purpose of giving signals and regulating turnouts."

61. For an *Improved Door Holder*; Edmund Morris, Burlington, Burlington county, New Jersey, June 19.

Claim.—"What I claim as my invention, is the method of constructing

turnbuckles or fastenings for shutters and doors of all kinds, by attaching a plug or knob to the back of the shutter or door, the same fitting or passing into the cavity of a cup-shaped vessel, through an aperture in a disk of India rubber or other elastic substance, the said rubber being so regulated as to grasp the knob, and keep the door or shutter back, substantially as described."

62. For an *Improvement in Drying Grain*; Joseph H. Patten, City of New York, June 19.

Claim.—"What I claim as my invention, is the drying a mass of corn, or grain, or malt, or white lead, or flour, or meal, or similar substances, in a receptacle for the substance to be dried, having the air chamber placed within the receptacle, and under the mass or bulk of the corn, grain, flour, white lead, or other similar substance to be dried, and connected with a blowing or exhausting apparatus of sufficient power to drive or draw the air through and around the substances to be operated upon, in the manner specified, or in any similar manner."

63. For an *Improvement in Harness adapted to Horse Rakes*; Warren Parker, Putney, Windham county, Vermont, June 26.

The patentee says,—“My improvement consists, 1st, in making the thills or shafts of about two-thirds their usual length, or that which is generally given them, when they are supported by straps extending down from the back of the horse, and at or near his shoulders. 2d, In giving to these shafts, at their front ends, a greater distance apart, or a wider flare or opening, than they usually have. 3d, In bracing them on their front ends, by oblique braces extending from them to the rake head, as seen in the drawings. 4th, In arranging the loop or straps (of the harness) which support the shaft at the rump of the horse, and so as to bring the downward strain directly over his rump, instead of over or just in the rear of his shoulders. 5th, In attaching the tug straps, or draft straps, to the braces at or near their junction with the rake head, or to the rake head, so that they may stand obliquely with respect to the horse.”

Claim.—“What I claim as my invention, is the arrangement of the hanging straps, (or contrivances which hold up the thills,) so that they may bear on the rump and hips of the horse, instead of on his back at or near his shoulders, in the usual way; and, in combination with such an arrangement, I claim to make the short and flaring thills, made and applied to the rake head as specified. I also claim the mode of arranging the tug straps and their rear connexions: that is, the arranging them obliquely with respect to the horse, and connecting them to the braces or rake head, as specified.”

64. For an *Improvement in Seats for Railroad Cars*; J. D. Mowry and P. L. Hyde, assignees of Amos W. Snow, Norwich, New London county, Connecticut, June 26.

Claim.—“What I claim as my invention and improvement, is the hori-

zontal rod attached to the frame of the seat, in combination with the fixed standards, when constructed and operating in the manner set forth."

65. For an *Improvement in Hill Side Ploughs*; Daniel Robb, Sangamon county, Illinois, June 26.

Claim.—"I claim as my invention, the extension of the mould-board, as described, and the arrangement of the mould-board as to make it and the landside revolve together, and enable either the upper or the lower edge to act as a share, and to throw the soil upon either side of the ploughman.

"I also claim as my invention, in combination with the above, the arrangement of the iron rod, and the iron bars, and its arm, so as to secure the mould-board in a firm position when used.

"I also claim as my invention, the construction of a three-sided landside, which is not fastened permanently to the wood-work, but acts independently thereof, as specified."

66. For an *Improved Adjustable Platform Animal Trap*; James Thomas, West Chester, Chester county, Pennsylvania, June 26.

The patentee says,—“My invention and improvement consists in constructing a trap with an adjustable counterpoise, whereby it can be adapted to catching large or small animals, and when large animals alone are to be caught, it can be adjusted so as to prevent its being discharged by the weight of smaller ones passing over it.”

Claim.—“What I claim as my invention, is the combination of the spring spiked frame and adjustable platform, made, arranged, and connected in the manner and for the purpose set forth.

“I likewise claim the combination of the hinged platform with the counterpoise for adjusting the platform, so as to make the trap go off with more or less force, thus adapting it to animals of different sizes.”

67. For *Improvements in the Rotating Permutation Plate Lock*; Henry C. Jones, assignee of Henry Ritchie, Newark, Essex county, New Jersey, June 26.

The patentee says,—“My improvements relate to that class of permutation locks in which the tumbler, which secures the bolt when thrown out, is permitted to move by projections thereon, which enter slots in a series of rotating permutation plates, a shifting index being connected with each of the permutation plates, for the purpose of changing the permutations, and the tumbler being made to move at right angles with the line of motion of the bolt.”

Claim.—“What I claim as my invention, is locking the indices to the permutation plates, when the tumbler is thrown up, to lock the bolt by means of the flanches or other equivalent on the tumbler, substantially as described, to prevent the possibility of changing the permutation after the bolt has been locked, as described, when the lock is so arranged that the relation between the dials and the permutation plates may be changed without opening the lock case.”

68. For an *Improvement in Churns*; Z. C. Robbins, St. Louis, Missouri, June 26; anté dated June 1.

The patentee says,—“The nature of my invention consists in giving such a form to a rotating agitator that the beaters placed upon it will cut through the milk or cream edgewise, and, by their broad, parallel, or converging surfaces, raise a portion of the cream at each revolution up into the air in the upper part of the churn, and thereby separate the particles thereof.”

Claim.—“What I claim as my invention, is the series of floats or beaters, formed and arranged as described, so as, by their thick inclined rear edges, they shall, when their motion is reversed, gather the butter in towards the centre and collect it there, substantially as set forth.”

69. For an *Improvement in Extension Tables*; Thomas P. Sherborne, Philadelphia, Pennsylvania, June 26.

Claim.—“What I claim as my invention, is, 1st, the combination of the projecting pin and the groove with the series of jointed levers, whereby the two ends of the tables are caused to recede from, and approach each other in right lines, which ensures at all times the accurate meeting and joining of the movable and stationary leaves.

“The manner of extending or contracting the table, and holding it in any given position, by means of the combination of the turning rack and pinion with the slotted lever and catches, arranged and operated substantially as set forth.

“The combination of the semi-circular rollers with the groove in the joint pin, for the purpose of securing the latter in place, and forming a bearing for its neck to turn in.”

70. For *Improvements in Instruments for Teaching Music with the Piano Forte*; E. Von Heeringen, Pickensville, Pickens county, Alabama, June 26.

Claim.—“What I claim as my invention, is, 1st, the method of exercising and training the fingers of those who are learning to perform on the piano forte, by springs, weights, or other equivalent device, arranged as set forth, or in any other substantially similar manner.

“2d, I claim the application to the piano forte of an adjustable rod, with pins, sharp points, or any other equivalent device, attached to its upper surface, for the purpose of causing the wrists of the performer to be duly elevated.

“3d, I claim the manner of teaching pupils to move their fingers, hands, and arm below the elbow, parallel to the keys of the instrument, whether playing first, last, or middle octaves, by confining the wrists to blocks which slide on a rod parallel to the front of the instrument, and adjustable to suit different performers, or any other analogous device by which similar results are produced.”

71. For an *Improvement in Spark Arresters*; James A. Cutting, Boston, Massachusetts, June 26.

The patentee says,—“The nature of my invention consists in placing above the top of the chimney a deflecting cap, made in the form of an inverted funnel, with the outer part bent down all around in a curve, to reverberate the products of combustion and force them down, when this is combined with a series of radial and inclined or curved shutes or passages, arranged below the deflecting reverberating cap, through which the products of combustion pass, and by which they are, at the same time, caused to take a revolving motion around the chimney, so that the sparks and other solid matter may be forced into a receptacle below, through a series of radial apertures in a diaphragm, each of the said radial apertures being provided along one edge with an inclined flanch, the better to catch the sparks, &c., and cause them to be deposited, while, at the same time, the passage of the currents through the series of shutes has the effect, in part, to exhaust, whenever the force (such as a jet of steam) which impels the draft is momentarily suspended, and thus continue the draft during the pulsations of the jets of steam.

“My invention also consists in combining with the reverberating cap and series of radial and inclined or curved shutes, an external series of radial and inclined or curved shutes, outside of the first series, together with apertures in the casing, leading into another receptacle, so that, after the products of combustion have been carried around in one direction, the current shall be caused to change its direction, and also to turn upwards and outwards to pass through the second series of shutes, and, whilst revolving, force the solid particles through the apertures into the surrounding and outer receptacle, the reversing of the direction of the revolution below the two series of shutes having the effect to deposit the solid particles in the lower receptacle more effectually than would otherwise be the case.”

Claim.—“What I claim as my invention, is, 1st, the deflecting and reverberating cap, and the chimney, in combination with the first series of inclined or curved shutes below the top of the chimney, substantially as described.

“2d, I claim the perforated diaphragm below the shutes, in combination with the inclined shutes and cap, substantially as described.

“3d, I claim the second series of inclined or curved shutes, in combination with the first series of shutes, the cap, and the chimney, substantially as described.

“And finally, I claim the surrounding apertures leading into a receptacle for sparks, in combination with the two reversed series of inclined shutes, substantially as described.”

72. For *Improvements in Harvesters*; Pells Manny, Wadam's Grove, Stephenson county, Illinois, June 26.

The patentee says,—“My invention consists, 1st, in combining revolving spiral cutters with a series of stationary knives, the two being so arranged with respect to each other as to act on the standing grain like the cutting edges of a common shears. 2d, In raising or lowering the cutter frame, in such manner that the cutters shall always act upon the grain at

the angle best suited to the distance from the ground at which the straw is cut, while the band which gives motion to the revolving cutters shall be always kept equally stretched, irrespective of the position of the cutter frame. 3d, In the method of altering the direction of the progressive motion of the machine upon the surface of the ground."

Claim.—"What I claim as my invention, is arranging a series of inclined knives diagonally across the spaces between the fingers, the front end of the cutting edge of one knife projecting beyond the rear end of the cutting edge of the one next succeeding it, substantially as described, and acting in combination with revolving spiral cutters.

"2d, I likewise claim attaching the pole (to whose hinder extremity the team is attached) to the hinder part of the carriage by a pivot, in combination with the ropes and windlass by which it is turned, by which arrangement the machine may be turned in a small space, and without inconveniencing the team."

73. For an *Improvement in the Boilers and Water Heaters of Locomotive Engines*; Levi B. Tyng, Lowell, Middlesex county, Massachusetts, assignee of Thatcher Perkins, Baltimore, Maryland, June 26.

The patentee says,—“The nature of my improvement consists in the mode of heating water to supply the boilers, and in constructing the parts of the locomotive boiler therefor, by which I protect the smoke box, and employ the waste heat to advantage.”

Claim.—“I claim as my invention, 1st, the branch exhaust pipe, surrounded by a water space, combined with the ordinary exhaust pipe, so that a portion or the whole of the steam may be directed through either pipe; the whole being constructed substantially in the manner and for the purpose herein described.

“2d, I claim the water case surrounding the smoke box, into which the supply water is forced to be fed into the boiler, by which I effect the double purpose of heating the water by the waste heat before it enters the boiler, and also protect the smoke box from destruction by the intense heat of the flues and cinders.”

74. For an *Improvement in the Attachment of Harrows to Ploughs*; Jacob Stroop, Philadelphia, Pennsylvania, June 26.

Claim.—“What I claim as my invention, is attaching the harrow to the plough in the manner described: that is to say, attaching the long arm anterior to the coulter, and the short arm in the rear of the sheath, in the manner and for the purpose set forth.”

ADDITIONAL IMPROVEMENT FOR JUNE, 1849.

1. For an *Improved Right or Left Hand Lock*; L. R. Livingston, J. J. Roggen, and C. Adams, Pittsburg, Pennsylvania; originally patented May 1, 1849, additional improvement annexed June 5.

Claim.—“What we claim as our invention, is the constructing the lock tumbler of two parts, of such a form, and combined with each other, and

with the arms of the lock bolt, in such a manner in relation to the keyholes, placed in reversed positions near each end of the lock, that a key will operate the tumbler and bolt equally well when inserted into either of the said keyholes, substantially in the manner set forth."

RE-ISSUES FOR JUNE, 1849.

1. For an *Improvement in Cooking Stoves*; R. D. Granger, Albany, New York, assignee of E. Johnson and D. B. Cox, Troy, New York; patented July 22, 1845, re-issued June 19.

The patentees say,—“The first part of our invention consists in making depressions or recesses in the bottom flue below the oven bottom, and towards the sides thereof, so that the greater part of the heated products of combustion shall pass along under the oven plate, through the parts of the flue or flues thus enlarged, and in this way avoid the concentration of heat in the middle of the oven.

“And the second part of our invention consists in combining a fire-place in the front hearth, or in what is called the summer arrangement, with the fire-place in the body of the stove, by means of a pipe or flue passing from the first to the ash pit of the second, and through the front diving flue, which carries down the products of combustion from the fire chamber in the body of the stove to the flue or flues below the oven.”

Claim.—“What we claim as our invention, is making the depressions in the bottom flue below the oven, substantially as described, for the purpose of equalizing the heat in the oven, as described.

“And we also claim as our invention, the combination of the two fire-places, by means of a flue pipe connecting the one with the ash pit of the other, and passing through the ash pit to divide the draft, substantially as described, and thus insure the passage of the heated products of combustion from either or both, around the oven, when desired, as described.”

2. For an *Improvement in Screw Wrenches*; Loring Coes, Worcester, Worcester county, Massachusetts; patented April 16, 1841, re-issued June 26.

The patentee says,—“The principle or character of my invention consists in moving the adjustable jaw, by means of a screw placed at the side of, and parallel with, the bar of the permanent jaw and handle, when the required rotation for sliding the jaw is given by a rosette or head, or the equivalent thereof, which retains the same position relatively to the handle.

“And my invention also consists in retaining the required position of the rosette, or its equivalent, by which the required motion is given to the sliding jaw, by having its periphery to work in a notch or recess in the bar of the permanent jaw or handle, or vice versa.”

Claim.—“What I claim as my invention, is moving the sliding jaw by a screw, combined with, and placed by the side of, and parallel with the bar of the permanent jaw and handle, substantially as described, when the required rotation for sliding the jaw is given by the head or rosette, or its equivalent, which retains the same position relatively to the handle during the operation, substantially as described.

"And I also claim moving the sliding jaw by a screw, combined with, and placed by the side of, and parallel with, the bar of the permanent jaw and handle, substantially as described, in combination with the rosette, or its equivalent, retained in its position relatively to the hand, in the manner described."

DESIGNS FOR JUNE, 1849.

1. For a *Design for Stoves*; Aug. Qackenboss, assignee of Samuel W. Gibbs, Albany, New York, June 26.

Claim.—"What I claim as my invention, is the ornamental design of stove plates for cooking stoves, as represented in the accompanying drawing."

2. For a *Design for Stoves*; Charles W. Warnick, Philadelphia, Pennsylvania, June 26.

Claim.—"I claim to be the original inventor or producer of the design and ornamental part of said stove."

3. For a *Design for Stoves*; Samuel H. Ransom, Albany, New York, June 26.

Claim.—"What I claim as my invention, is the combination and arrangement of ornamental figures and forms, represented in the drawings, the same forming an ornamental design for an elevated oven."

4. For a *Design for Stoves*; Samuel H. Ransom, Albany, New York, June 26.

Claim.—"What I claim as my invention, is the combination and arrangement of ornamental figures and forms, represented in the annexed drawings, making an ornamental design for an air-tight parlor stove."

List of American Patents which issued in the Month of July, 1849, with Exemplifications by CHARLES M. KELLER, *late Chief Examiner in the U. S. Patent Office.*

1. For a *Centripetal Press*; James E. Serrell and David Smith, City of New York, July 3.

Claim.—"What we claim as new, is the application of a plurality of pressing blocks, which, with the exception of the bottom and top, enclose on all sides the material to be acted on, and which blocks are so constructed as to allow of their lateral compressing action when moved in the compound direction described by a like number of wedges, or with any analogous or equivalent device, through which any competent power can act to force the blocks with a simultaneous compound and centripetal motion

that concentrates the pressure on a plurality of surfaces of material, to give the material a required form or degree of pressure, substantially as described and shown.

2. For an *Improvement in Cooking Stoves*; Wm. E. and Henry Bleecker and Samuel D. Vose, Albany, New York, July 3.

The patentees say,—“The invention or improvement consists of the elevation of the sides of the flues, for the purpose of equalizing the heat in the flue under the bottom of the oven.”

Claim.—“What we claim as our invention, is making the lower flue, under the oven, elevated at the outsides, formed between the bottom and the bottom oven plates, as described.”

3. For an *Improvement in Keyed Musical Instruments*; Joseph Alley, Newburyport, Essex county, and Henry W. Poole, Worcester, Worcester county, Massachusetts, July 3.

Claim.—“What we claim as our invention, is, 1st, the selectors, cords, and connectors, combined with the valves and the finger key of the common key-board, substantially in the manner and for the purposes set forth.

“2d, The so combining a system of pedals, equal in number to the number of keys or scales to be played in, with the mechanism by which each finger key is connected with the valve and pipe of the desired scale, that, on putting down the pedal belonging to any scale, it shall at once attach to the finger keys, usually employed in playing that scale upon the common organ, the valves of the pipes truly belonging to it, (the scale,) and at the same time raise the pedal that was before down, and detach the valves which are not wanted.

“3d, The pedals, combined with the pulleys, and with the selectors, in the manner and for the purpose set forth.”

4. For an *Improved Manufacture of Bags and Sacks*; William B. Carlock, City of New York, July 3.

The patentee says,—“My invention for weaving bags without seam consists in weaving together two or more warps to form one cloth, and, with the same weft, two or more warps to form the other cloth, when the weft is carried around from one cloth to the other, at one or both ends, to unite the cloths, in combination with the weaving and uniting of the two cloths together, at given distances apart, to form either the closed end or closed sides of the bag.”

Claim.—“What I claim as my invention, is the producing a new manufacture of bags, by weaving together two or more warps above, and two or more warps below, to form two or more cloths, when the weft is carried around from the one to the other, at one or both sides, to unite the two cloths, substantially as herein described, in combination with the weaving of the two cloths together at given points, to unite them, by weaving together all the warps at given distances, for forming the closed sides or ends of bags, substantially as described.”

5. For an *Improvement in Machines for Cutting Veneers from Cylindrical Blocks*; Benj. S. Stedman, Warren, Worcester county, Massachusetts, July 3.

The patentee says,—“My invention relates to improvements on the machine for sawing, by means of a circular saw, veneers from the periphery of a cylindrical block in the form of a volute, and principally intended for the sawing of ivory, in which great accuracy is required in the movements of the various parts.”

Claim.—“What I claim as my invention, is the reciprocating saw carriage, in which the saw is operated by a belt from a driving pulley on the main frame, and passing around a guide pulley on the permanent frame, and the guide pulleys on the carriage, substantially as described, in combination with the carriage which carries the block to be sawed, and which has an intermittent motion towards the saw, derived from the reciprocating motion of the saw carriage, substantially as described.

“I also claim the combination of the apparatus for giving the advancing motion of the block towards the saw, with the apparatus which gives the rotating feed motion to the block, substantially as described; but this I only claim when the two are connected together and derive their motions one from the other, and when the connexion between the two is adjustable to vary their relative motions, substantially as described.

“I also claim the combined apparatus for advancing and rotating the block, in combination with the reciprocating saw carriage, by the means substantially as herein described, when the method of operating the carriage is adjustable to various lengths of blocks, and when the said connexions between the carriage and the advancing and rotating apparatus are adjustable, substantially as described.”

6. For an *Improvement in Machinery for Jointing Staves*; Lewis S. Chichester, Troy, New York, July 3.

The patentee says,—“The object of my invention is to joint staves in the required curve for the bulge or bilge of casks or barrels, without the necessity of bending them in a clamp, as heretofore generally practised.”

Claim.—“What I claim as my invention, is the combination of the clamps, for holding and presenting the stave, with a turning spindle, by means of a hinge or other turning joint, substantially as described, for the purpose of presenting the two edges of the stave alternately to the action of the shaving wheel without removing it from the clamp, substantially as described.”

7. For an *Improvement in Winnowing Machines*; John W. Fisk, Rileytown, Butler county, Ohio, July 3.

The patentee says,—“The nature of my improvements consists in giving to the second separating riddle and screen, rocking, vertical, and longitudinal motions, (the screen having in addition thereto a shoveling motion,) the riddle being curved and presenting its concavity upwards, and the screen being in an incline sufficient, when moved, to have a tendency to deliver the heavy grain on the apron leading to the back part of the ma-

chine, while the heavy cheat falls through into the division in front of the apron, and the remnant of light cheat is blown over its front edge, and falls into a division in front of the last mentioned receptacle.

"Another part of my invention consists in curving the riddle aforementioned, and turning its concavity upwards, so as to give the blast of air produced by the fan a full sweep through the load, from its bottom to its top, as it lies on the riddle.

"Another part of my invention consists in hanging the screen to the second separating or concave riddle firmly, and in such wise that their front parts shall end in the same vertical plane, while the screen shall project rearwards one-fifth, more or less, of its entire length beyond the rear of the riddle.

"Another part of my invention consists in deriving the vertical and vibrating motions of the feeder, chaff riddle, apron, and first separating riddle, from the mechanism which gives the vertical, longitudinal, and rocking motion to the second separating or concave riddle and screen."

Claim.—"What I claim as new, is giving rocking, vertical, and longitudinal motions to the lowest or second separating and curved riddle and screen pendant thereto, by means of a mover and guide, curved, attached, and supported as described, or any equivalent device operated in an equivalent manner.

"2d, I also claim the second separating or lowest riddle, having its concavity upwards, in the manner and for the purpose described.

"3d, I also claim deriving the vertical and vibrating motions given to the feeder, chaff riddle, apron, and first separating riddle, from the mover and guide of the second separating and curved riddle and screen, as described, or in any equivalent way."

8. For an *Improvement in Regulators for Self-Acting Mules*; Ebenezer C. Sanger, Salem, Essex county, Massachusetts, July 3.

The patentee says,—“My improvement is for the purpose of gradually and properly reducing to a certain velocity the speed of the spindles, after the mule carriage has been run out to the extent of its motion, and the necessary amount of twist has been put in the yarns, previous to the backing off of the spindles and running in of the carriage.”

Claim.—“What I claim as new, is the regulator, constructed and made to operate substantially as above described, the same consisting of the combination of the weighted centrifugal lever, the lower pawl or click, the ratchet wheel, its cam, and the lever *n*, applied together and to the main driving shaft, and the slide of the twist cam, essentially as specified.

“And, as auxiliary to the above, the second centrifugal weighted lever, and the ring and retractive spring in combination therewith, the same being for the purpose explained.”

9. For an *Improvement in Windmills*; Emory and Emerson Gore, Charleston, Lee county, Iowa, July 3.

The patentees say,—“The nature of our invention consists in propelling machinery by wind or water, by means of horizontal expanding and closing sails or wings, which may be regulated to any force of wind.”

Claim.—“What we claim as our invention, is the horizontal expanding and closing sails or wings, as applied for the purpose of propelling machinery by wind or water, in combination with the mode by which they are regulated, as described.”

10. For an *Improvement in Live Spindles and Flyers*; Wm. Mac Lardy and Jos. Lewis, Manchester, England, July 3; anté dated May 9, 1848.

The patentees say,—“Our improvements consist, 1st, in forming the spindle in two separate parts, and connecting the two parts together by a joint or coupling, so that they may revolve together as one solid spindle, and admitting of the upper part being readily disconnected from the lower part when necessary.

“2d, Our improvements in fixing the flyer permanently upon the upper part of the spindle.

“3d, In the employment of a rigid bearing at the top of the spindle, above the flyer, (in connexion with the spindle formed of two parts,) in addition to the bearings usually employed; and,

“4th, In making that portion of the spindle between the top bearing and the flyer, of a smaller diameter than the part of the spindle forming the said top bearing, so that, when the upper part of the spindle is disconnected from the lower part, and raised upwards, the upper portion of the said spindle can be held at such an angle as will admit of the full bobbin being taken off the spindle and replaced by the empty one.”

Claim.—“We claim as our invention, the construction and application (to the preparation and spinning of cotton, &c.) of a live spindle formed in two parts, as above described, and having the flyer permanently fixed to the upper part thereof; the upper part of the said spindle being supported in a fixed bearing, and so constructed and arranged as to allow it (when disconnected from the lower part and raised) to be held at an angle whilst doffing the full bobbin, substantially as described.”

11. For a *Machine for Contracting the Circumference of Wrought Iron Bands*; William Massey, Greene county, Illinois, July 3.

Claim.—“What I claim as my invention, is a machine for contracting, by compression, the circumference of every variety of wrought iron bands, wagon tires, &c., and for compressing and shrinking the same, as described, thereby dispensing with cutting and welding.”

12. For an *Improvement in Washing Machines*; Thos. King, West Farms, West Chester county, New York, July 3.

Claim.—“What I claim as my invention, is the combination of the rockers with the dasher and grooves, in the manner and for the purpose described.”

13. For an *Improvement in Attaching Buckles to Suspenders, &c.*; John Abernethy, Woodbury, Litchfield county, Connecticut, July 3.

The patentee says,—“The nature of my invention consists in forming a

clasp of tin, iron, copper, brass, or any other metal in common use, by which to attach the buckle and loop made use of to the elastic or other goods."

Claim.—"What I claim as my invention, is the method, herein described, of attaching buckles, loops, &c., to elastic or other goods, by means of my clasp, which I more particularly use for attaching buckles and loops to springs for vests and pantaloons, using in its construction any metallic plate most suitable for the purpose."

14. For an *Improvement in Bee Hives*; George Wheeler, Little Valley, Cataraugus county, New York, July 3.

Claim.—"What I claim, is the mode of forming and closing the entrance for the bees, on opposite sides of the hive, by means of a recessed or grooved lighting or bottom board, moving in grooves or otherwise, so as to operate in the manner and for the purpose described; the rectangular slides having projections at one end, and inserted through openings in opposite sides of the case, and moving in grooves in the lower edges of the front and back of the same, for retaining the bottom board in its place when dropped to form an entrance, and for horizontally moving back and forth, to regulate the space of ingress and egress for the bees."

15. For an *Improvement in Washing Machines*; Lewis W. Colver, St. Louis, Missouri, July 3.

Claim.—"What I claim as new, is the cleansing of cloths or clothing by the combined action of conducting and pressure rollers, with forced jets of suds or water, substantially in the manner set forth."

16. For a *Rotary Disk, Bolt, and Rivet Machine*; J. L. Kingsley, City of New York, assignee of J. G. Day, Brooklyn, New York, July 3.

The patentee says,—"The nature of my invention consists in the discovery of a speedy and useful way or process for making rivets and blank screws, with machinery therefor."

Claim.—"What I claim as my invention, is the arranging a set of dies upon a disk, or any equivalent thereto, equi-distant from the axis of the disk, and from each other, so that, by giving to the disk an intermittent progressive motion, a die may be brought to each of the several places, for receiving the several actions of feeding, heading, and discharging simultaneously, (while the disk remains at its rest or lock up,) and also cuts off a rod at the time of its revolving or progressive motion, when the disk and dies are combined with any apparatus for heading and discharging rivets.

"2d, I claim the combination of a disk of dies, having an intermittent progressive revolving motion, with an apparatus for heading rivets, and such like articles, whether the latter be constructed in the precise manner described, or by any equivalent mechanism that will produce a like result.

"3d, I claim the combination of a disk of dies, having an intermittent revolving motion, with an apparatus for knocking out or discharging rivets from the dies.

"4th, I claim any common and well known feeding apparatus, or any equivalent thereto, combined with a heading and discharging apparatus, and a disk of dies, having an alternating or intermittent revolving motion, for the purpose of conveying the dies from one position to another as required; the machinery herein described being applicable and competent to perform the several operations when fed with wire or rods, as herein set forth.

"5th, I claim the use of several hammers, to give several blows upon the same rivet, and for making screws, as well as the planing process of nicking as applied to a revolving disk of dies, in combination with the heading, feeding, discharging, and other apparatus and operations of the machine, all of which are herein described and set forth."

17. For *Improvements in Machinery for Picking Waste*; Joshua Bailey, Cohoes, Albany county, New York, July 3.

Claim.—"I claim, 1st, the shape and form of the pickers used in my machine, as described, as being peculiarly calculated to separate the threads of the material subjected to them, without injuring them and breaking their fibres to such an extent that they become unfit for carding and spinning.

"2d, The combination and arrangement of the whole machine, with the relative action of the cylinder, and roller, and whipper, to and upon each other, by which the material passing through the first feed rollers is, by its relative rate of motion, compared with that of the large cylinder, and also the relative arrangement of the teeth of the rollers, steadily and properly fed to the action of the pickers of the large cylinders, and at the same time held firmly to ensure the due action of the pickers; and by which, also, the second roller is made to seize the unfinished fragments that may be dropped from the first roller, and subjects them to the action of the pickers, in a similar manner to the operation of the first roller, so that the whole substance of the supplied material is thoroughly picked into long fibres, and prepared for carding and spinning into thread.

"3d, I claim as my improvement in waste picking machines, the application of picker cylinders, constructed and arranged to operate together, substantially as herein set forth and described, having teeth made in the manner and form set forth."

18. For an *Improvement in Circular Saw Mills*; David Philips, Pittsburg, Pennsylvania, July 3.

Claim.—"1st, What I claim as my invention, is making the plate of the saw in sections, whose inner angle rests upon the shaft and is secured to the rings and collar, substantially in the manner described, the radial edges of adjacent sections being separated from each other far enough to admit of the free expansion of the metal from heat without meeting, but connected by means which do not prevent this expansion, whereby the warping or buckling which invariably occur in solid plates, or those whose sections are in contact from partial heating, is effectually prevented, while at the same time the compound sectional plate, thus arranged, possesses sufficient strength and firmness for all practical purposes.

"2d, I likewise claim the method herein described, of preventing and arresting the vibrations in the saw plate, by causing it to pass between cushions, bristles, or other elastic surfaces, arranged as described, or in any other substantially similar manner."

19. For an *Improved Arrangement of the Sections in a Life-Preserving Hammock*; Samuel J. Seeley, City of New York, July 10.

The patentee says,—“This invention and improvement consists in the construction of a hollow, sectional, air-tight hammock of India rubber cloth, to be inflated with air, and provided with a provision pouch, pillow, water pouch, inflating tubes and valves, loops and toggles, slings, thimbles, lanyards, and other appendages, by which it is made to serve the purposes of a hammock mattress, and, in case of shipwreck, as a life preserver; also as a canoe and ponton, for the support of a bridge raft, for the removal of cargoes from stranded ships, barricades against the small shot of the enemy during an action, and for other purposes.”

Claim.—“What I claim as my invention, is making the hammock in three tubular sections, whether each section is composed of one or more tubes, each section being provided with an inflating and disinflating tube, so that, when the hammock is used as a life preserver, the centre section may be disinflated in whole or in part, thus forming a boat and retaining the occupant in his position, as set forth.”

20. For an *Improvement in Brick Presses*; Wm. B. Waldran and Godfrey Hargitt, Memphis, Shelby county, Tennessee, July 10.

Claim.—“What we claim, is the combination of the mud box and moulding apparatus, as described, consisting of a plunger to which a cutter is affixed, and connecting therewith the horizontal feeder, as fully set forth. We also claim, in combination with the above parts, the compressing apparatus adapted to this machine, for compressing bricks, and consisting of the press plate and press brick lever, constructed and operating as set forth.”

21. For an *Improvement in Mills for Grinding*; Thomas A. Chandler, Rockford, Winnebago county, Illinois, July 10.

The patentee says,—“The nature of my invention and improvement consists in combining a series of two or more grinding cylinders, running at unequal velocities, and vibrating in a direction parallel to their axes, and with equal or unequal and opposite motions, these rollers being placed nearly in contact, in order that grain passed between them may be crushed and rubbed in opposite ways at the same time, and thus be uniform and finely pulverized by the least possible contact with the grinding surfaces; the grinding cylinders, which are hollow, being kept cool by the circulation of a current of air through them, which is kept flowing by the action of oblique openings in their ends, those of one end being inclined in the contrary direction to those of the other, in order that one set of openings may favor the entry, and the other the escape of the air.”

Claim.—“What I claim as new, is the combination of two or more re-

volving oscillating cylinders, arranged and operated substantially as herein described, for the purpose of grinding grain and other substances.

"I likewise claim the manner herein described, of preventing the cylinders and the journals of their axes from becoming unduly heated, by keeping a constant current of air circulating through them by the action of the oblique lips of the radial apertures in their ends, as herein described."

22. For a *Spring and Tackle Sash Stopper*; John W. Hoffman, Philadelphia, Pennsylvania, July 10.

Claim.—"What I claim as my invention, is the application of the spiral spring, and also pulleys, applied and operating substantially as described, for raising and lowering window sash in windows."

23. For an *Improvement in Pressing Bonnets*; Miss C. C. Dow, Windham, Windham county, Connecticut, July 10.

Claim.—"What I claim as my invention, is, 1st, the combination of the suspended core box with a smooth steel pressing plate fastened to its under surface, tri-branched pressing bar, curved suspension and lifting springs, crane, adjustive connecting rods, swiveled bow, and the adjustive treadle, constructed, arranged, and operated in the manner and for the purpose set forth.

"2d, I also claim constructing the suspended box, to receive the core, in the manner and for the purpose set forth, irrespective of the parts to which it is connected and suspended.

"3d, I also claim the combination of the pressing iron, slotted lever, key, jointed connecting rod, and perforated arm to which the lever is connected, with the table to which the horizontal perforated arm is secured, for pressing the tip of the bonnet whilst on the roller of the crank shaft."

24. For an *Improvement in Distilling Apparatus*; Charles A. Krechler, Stockholm, Sweden, July 10. (Surrendered and cancelled Oct. 18.)

Claim.—"What I claim as my invention, is the combination of one or more charcoal chambers, and one or more water vessels, arranged and applied together substantially as above specified, and for the purpose of cleansing the alcoholic spirit of ætherical oil (called in the German language Fusel öhl) and water, essentially as explained; each of the said charcoal chambers being made either with or without the reflecting disk or plate arranged in its top, the same (viz., the disk) being for the purpose of causing the vapor which passes into the charcoal to escape laterally, and impinge against the surrounding cooling vessels, whereby its water may be condensed, which would not so effectually take place were the vapor to pass directly and vertically through the mass of charcoal."

25. For an *Improved Window Shutter Fastener*; Jacob Stroop, Philadelphia, Pennsylvania, July 10.

Claim.—"What I claim as my invention, is the combination of the pin, clasp, and side bolt, arranged as described, with the sash when fastened,

so that the clasp cannot be raised from the pin, nor the sliding bolt from its catch, so long as the sash is fastened, thereby securing the shutters at top and bottom, and entirely prevent their being loosed by boring through the shutter, as described and represented.”

26. For an *Improvement in Portable Cot Bedsteads*; Abraham McDonough, Philadelphia, Pennsylvania, July 10.

Claim.—“What I claim as my invention, is the construction of a folding cot bedstead, as described: that is to say, the folding legs, with hinges, combined with the connecting support and thumb screws, in the manner and for the purpose set forth.”

27. For an *Improvement in the Method of Arranging and Working the Valves of Auxiliary Engines for Feeding Boilers*; Richard Van Dyke, Jr., assignee of Rufus Porter, City of New York, July 10.

Claim.—“What I claim as my invention, is the combination of the valves, the cross head, the valve rod, and the hollow piston rod, arranged in the manner and for the purpose described. I also claim the mode described of working the valves by means of the plate spring.”

28. For an *Improvement in Machinery for Spinning Cotton*; Charles K. Tisdale, joint inventor with, and assignee of, James and Thomas Keane, Cornwall, Orange county, New York, July 17.

The patentees say,—“The nature of our invention consists in improvements in the stationary spinning frame, whereby we are enabled to spin the peculiar kind of yarn now only obtained from the machine known as the mule, or modifications of that machine, and lies in combining the instrument known as the ‘ring and traveler’ with the pointed spindle, similar to that used on the mule, and operated so that the points of the spindles will always remain at one fixed distance from the rollers.”

Claim.—“What we claim as of our own invention, is the continuous and unintermitted spinning of ‘slack twisted yarns,’ similar to, and of the kind heretofore only spun upon mules and like machines, upon the stationary spinning frames, by passing the said yarn directly from the front roller upon the point of the spindle, without any intervening guide wire or guide, and without changing the relative positions of the rollers and spindles, as set forth and described.”

29. For an *Improvement in Wheat Cleaning Machines*; David L. Ewing, Spruce Hill, Juniata county, Pennsylvania, July 17.

The patentee says,—“The nature of my improvement consists in employing two extended rubbing surfaces, pressed together with a force sufficient to break any substance of less tenacity than wheat, but elastic, so as to yield for any variation of feed, by which means rat-dung and other similar substance is broken fine, and, by a blast of air, carried away from the grain.”

Claim.—“What I claim as new, is the employment of the leather-covered

cylinder, in combination with the leather-covered spring concave, constructed substantially as above described, for removing rat-dirt and other substances from wheat, as set forth."

30. For an *Improvement in Ox-Yoke Fastenings*; Andrew Hotchkiss, Sharon, Litchfield county, Connecticut, July 17.

Claim.—"I claim the construction of the curved arms, as formed according to the above description, so as to embrace with their front parts the bow, the rear parts being so shaped as to form a thumb and finger piece, by which the grasp of the arms may be released, together with the spring by which the arms are kept closed.

"I claim the pin as a whole, with the entire combination of pin proper, arms, and spring, as set forth."

31. For an *Improvement in Cutting, Crushing, and Grinding Vegetables*; Luther B. Fisher, Freeport, Stephenson county, Illinois, July 17.

Claim.—"What I claim as my invention, is the adjustability of the cylinder and its parts, as shown, for aiding the feeding, in combination with the cutting and grinding apparatus within said cylinder, as set forth."

32. For an *Improvement in Lounge and Chair Combined*; Abner J. Linikin, Roxbury, Norfolk county, Massachusetts, July 17.

Claim.—"What I claim as my invention, is the arrangement and combination with each other of the back, side, arms, and forward supports of the arms of the chair, for folding up when the instrument is to be used as a bed.

"I also claim the construction and use of the double inclined plane, for the double purpose of a pillow to the lounge, and for a writing desk, as described."

33. For a *Method of Increasing the Effective Length and Cleansing Boiler Flues*; Abner Chapman, Fairfax, Franklin county, Vermont, July 17.

The patentee says,—"The nature of my invention consists in furnishing the horizontal flues of a steam boiler with spiral partitions, which partitions can be made to revolve to clear the flue, by which arrangement I am enabled to obtain all the advantages of a spiral flue, which has been heretofore essayed and found useful, till it became choaked with ashes, &c., when it was found impossible to clean it; but, by my construction, the inside or spiral flue can be revolved, and thus be made to clean the flue perfectly, while it retains all the advantages of the stationary spiral flue."

Claim.—"What I claim as my invention, is spiral partitions, forming a spiral flue within the flues of a steam boiler, substantially as described, said thread being affixed to a shaft independent of the flue, so that it can be made to revolve, to scrape the flue, and clear it when it gets foul."

To be continued.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On an Equation between the Temperature and the Maximum Elasticity of Steam and other Vapors. By WILLIAM JOHN MACQUORN RANKINE, Civil Engineer.**

In the course of a series of investigations founded on a peculiar hypothesis respecting the molecular constitution of matter, I have obtained, among other results, an equation giving a very close approximation to the maximum elasticity of vapor in contact with its liquid at all temperatures that usually occur.

As this equation is easy and expeditious in calculation, gives accurate numerical results, and is likely to be practically useful, I proceed at once to make it known, without waiting until I have reduced the theoretical researches, of which it is a consequence, to a form fit for publication.

The equation is as follows:—

$$(1.) \quad \text{Log. } P = \alpha - \frac{\beta}{t} - \frac{\gamma}{t^2}$$

Where P represents the maximum pressure of a vapor in contact with its liquid:—

t , the temperature measured on the air thermometer, from a point which may be called the ABSOLUTE ZERO, and which is—

274°·6 of the *centigrade scale* below the freezing point of water.

462°·28 of *Fahrenheit's scale* below the *ordinary* zero of that scale, supposing the boiling point to have been adjusted under a pressure of 29·922 inches of mercury, so that 180° of Fahrenheit may be exactly equal to 100 centigrade degrees.

461°·93 below the ordinary zero of Fahrenheit's scale, when the boiling point has been adjusted under a pressure of 30 inches of mercury, 180° of Fahrenheit being then equal to 100°·0735 of the centigrade scale.

The *form* of the equation is given by theory; but three constants, represented by α , β , and γ , have to be determined for each fluid by experiment.

The inverse formula, for finding the temperature from the pressure, is of course

$$(2.) \quad \frac{1}{t} = \sqrt{\frac{\alpha - \text{Log. } P}{\gamma} + \frac{\beta^2}{4\gamma^2}} - \frac{\beta}{2\gamma}$$

It is obvious that for the determination of the three constants, it is sufficient to know accurately the pressures corresponding to three temperatures; and that the calculation will be facilitated if the reciprocals of those temperatures, as measured from the absolute zero, are in arithmetical progression.

* From the Edinburgh New Philosophical Journal, for July, 1849.

In order to calculate the values of the three constants, for the vapor of water, the following data have been taken from M. Regnault's experiments:—

Temperatures in Centigrade degrees.		Common Logarithms of the Pressure in Millimetres of Mercury.	REMARKS.
Above the Freezing Point.	Above the Absolute Zero.		
220°00	494°60	4·2403000	{ Measured by M. Regnault on his curve, representing the mean results of his experiments.
100°00	374°60	2·8808136	Logarithm of 760 millimetres.
26°86	301°46	1·4198000	{ Calculated by interpolation from M. Regnault's general table.

These data give the following results for the vapor of water, the pressures being expressed in millimetres of mercury, and the temperatures in centigrade degrees of the air thermometer:—

$$\begin{aligned} \text{Log. } \gamma &= 5\cdot0827176 & \text{Log. } \beta &= 3\cdot1851091 \\ \alpha &= 7\cdot831247. \end{aligned}$$

Table I. exhibits a comparison between the results of the formula and those of M. Regnault's experiments, for every tenth degree of the centigrade air thermometer, from 30° below the freezing point to 230° above it, being within one or two degrees of the whole range of the experiments.

M. Regnault's values are given, as measured by himself, on the curves representing the mean results of his experiments, with the exception of the pressures at 26°·86, one of the data already mentioned, and that at — 30°, which I have calculated by interpolation from his Table, series *h*.

Each of the three data used in determining the constants is marked with an asterisk. (*)

In the columns of differences between the results of the formula and those of experiment, the sign + indicates that the former exceed the latter, and the sign — the reverse.

Beside each such column of differences is placed a column of the corresponding differences of temperature, which would result in calculating the temperature from the pressure by the inverse formula. These are found

by multiplying each number in the preceding columns by $-\frac{dt}{dP}$, or by

$$\frac{-dt}{d \text{ Log. } P}, \text{ as the case may require.}$$

TABLE I.—Vapor of Water.

Temperatures in Centigrade degrees of the Air Thermometer from The freezing point.	Pressures in millimetres of Mercury, according to The Formula.	Pressures in millimetres of Mercury, according to M. Regnault's Experiments.	Difference between Calculation and Experiment in millimetres.	Corresponding differences of temperature.	Common Logarithms of the Pressures in millimetres according to The Formula.	Common Logarithms of the Pressures in millimetres according to M. Regnault's Experiments.	Differences between Calculation and Experiment in Logarithms.	Corresponding differences of temperature.	Temperatures above the freezing point.
— 30	244.60	0.35	0.34	— 0.42	2.8808136	2.8808	0.0000	0.00	100
— 20	254.60	0.89	0.91	— 0.25	3.0313620	3.0307	+ 0.0007	0.05	110
— 10	264.60	2.07	2.08	— 0.06	3.1732040	3.1734	— 0.0002	0.01	120
0	274.60	4.47	4.60	— 0.13	3.3070610	3.3076	— 0.0005	0.04	130
+ 10	284.60	9.05	9.16	— 0.11	3.4335760	3.4332	+ 0.0004	0.03	140
+ 20	294.60	17.33	17.39	— 0.06	3.5533340	3.5537	— 0.0004	0.03	150
* 26.86	301.46	26.29	26.29	0.00	3.6668530	3.6676	— 0.0007	0.06	160
30	304.60	31.57	31.55	0.02	3.7746030	3.7750	— 0.0004	0.04	170
40	314.60	55.05	54.91	0.14	3.8770050	3.8772	— 0.0002	0.02	180
50	324.60	92.26	91.98	0.28	3.9744430	3.9743	+ 0.0001	0.01	190
60	334.60	149.15	148.79	0.36	4.0672680	4.0674	— 0.0001	0.01	200
70	344.60	233.48	233.09	0.39	4.1557960	4.1561	— 0.0003	0.03	210
80	354.60	355.04	354.64	0.40	4.2403000	4.2403	0.0000	0.00	220
90	364.60	525.70	525.45	0.25	4.3210830	4.3207	+ 0.0004	0.05	230
* 100	374.60	760.00	760.00	0.00					
110	384.60	1074.82	1073.70	1.12					
120	394.60	1490.10	1489.00	1.10					
130	404.60	2028.00	2029.00	1.00					
140	414.60	2713.80	2713.00	0.80					
150	424.60	3575.50	3572.00	3.50					
160	434.60	4613.60	4647.00	3.40					
170	444.60	5951.20	5960.00	8.80					
180	454.60	7533.70	7545.00	11.30					
190	464.60	9428.50	9428.00	0.50					
200	474.60	11675.00	11660.00	15.00					
210	484.60	14315.00	14308.00	7.00					
* 220	494.60	17390.00	17390.00	0.00					
230	504.60	20945.00	20915.00	30.00					

In comparing the results of the formula with those of experiment, as exhibited in Table I., the following circumstances are to be taken into consideration:—

First, That the uncertainty of barometric observations amounts in general to at least one-tenth of a millimetre.

Secondly, That the uncertainty of thermometric observations is from one-twentieth to one-tenth of a degree, under ordinary circumstances, and at high temperatures amounts to more.

Thirdly, That, in experiments of the kind referred to in the table, those two sorts of uncertainty are combined.

The fifth column of the table shews that, from 30° below the freezing point to 20° above it, where the minuteness of the pressures makes the barometric errors of most importance, the greatest difference between experiment and calculation is $\frac{1}{1000}$ of a millimetre, or $\frac{1}{2000}$ of an inch of mercury, a very small quantity in itself, although, from the slowness with which the pressure varies at low temperatures, the corresponding difference of temperature amounts to $\frac{3}{80}$ of a degree.

The sixth and tenth columns shew that, from 20° to 230° above the freezing point, the greatest of the discrepancies between experiment and observation corresponds to a difference of temperature of only $\frac{8}{1000}$ of a degree, and that very few of those discrepancies exceed the amount corresponding to $\frac{1}{20}$ of a degree.

A comparison between the sixth and tenth columns shews that, for four of the temperatures given, viz., 120° , 150° , 200° , and 210° , the pressures deduced from M. Regnault's curve of actual elasticities, and from his logarithmic curve respectively, differ from the pressures given by the formula in opposite directions.

If the curves represented by the formula were laid down on M. Regnault's diagram, they would be almost undistinguishable from those which he has himself drawn, except near the freezing point, where the scale of pressures is very large, the heights of the mercurial column being magnified eight-fold on the plate. In the case of the curves of logarithms of pressures above one atmosphere, the coincidence would be almost perfect.

The formula may therefore be considered as accurately representing the results of all M. Regnault's experiments throughout a range of temperatures from 30° of the centigrade scale below the freezing point to 230° above it, and of pressures from $\frac{1}{2200}$ of an atmosphere up to 28 atmospheres.

It will be observed that equation (1.) bears some resemblance to the formula proposed by Professor Roche in 1828, viz:

$$\text{Log. } P = A - \frac{B}{T+C}$$

where T represents the temperature measured from the ordinary zero point, and A, B, and C, constants, which have to be determined from three experimental data. It has been shewn, however, by M. Regnault, as well as by others, that though this formula agrees very nearly with observation throughout a limited range of temperature, it errs widely when the range is extensive. I have been unable to find Professor Roche's memoir, and I do not know the reasoning from which he has deduced his formula.

The use in computation of the equations I have given, whether to calculate the pressure from the temperature, or the temperature from the pressure, is rapid and easy. In Table II. they are recapitulated, and the values of the constants for different measures of pressure and temperature are stated.

In calculating the values of α the specific gravity of mercury has been taken as 13.596.

Temperatures measured by mercurial thermometers are, in all cases, to be reduced to the corresponding temperatures on the air thermometer, which may be done by means of the table given by M. Regnault in his memoir on that subject.

To be Continued.

For the Journal of the Franklin Institute.

On Smelting Magnetic Iron Ores. By MR. H. FAIRBAIRN.

Amongst the most interesting branches of observation which are presented to the view of the traveler, amongst the iron furnaces and through the iron ore regions of Pennsylvania, none is of more striking importance, in its probable ultimate revolutionary consequences on all the future iron manufacturing of Europe and of America, than the progress towards perfection in the yet imperfectly established system of smelting the magnetic iron ores of Pennsylvania, or those ores which abound in the primitive rocks in various parts of the State.

Although these iron ores have been hitherto known, in a manufacturing point of view, principally in New Jersey, or in Pennsylvania, and only in the region of the Lehigh river, yet the geology of this part of the continent of America displays, in the utmost distinctness, the continuation of the same rocks through a very wide range of country, from North to South,—from Connecticut through New Jersey, New York, Pennsylvania, Maryland, Virginia, South Carolina, and the South-Western States, under various local names. The mountains are of primitive formation, and they are universally non-volcanic,—the strata consequently continuous, and unbroken by the mechanical forces which have disturbed the stratification of so large a part of the European countries,—and the same iron ores may be reckoned upon as existing almost everywhere throughout the range of the primitive mountains of the United States.

The degradation of the mountains is various, as local circumstances may have produced aqueous decomposition in the varying degrees; but this has served the very useful purpose of laying open the deposits of iron in all the stages of geological formation, and it only remains for the manufacturer of iron to choose his location over hundreds of miles of country; or if fuel be absent from any part of the region where a particular iron ore be seen upon the surface, then to dig will be to find (in almost any other situation) the magnetic iron ores, at some depth, however various, between the surface and the granite foundation of the earth.

Scattered furnaces there are throughout Virginia, Maryland, South Carolina, and Alabama, and these furnaces are all engaged in the smelting of the magnetic ores of iron; but they are principally charcoal furnaces, on

the comparatively petty scale which is that of all iron furnaces dependent on wood for fuel, in this age of colossal competition for the manufacture of the iron of the world at large.

Through the circumstance of the existence of the anthracite coal fields in the State of Pennsylvania, and that all the ores of iron exist also in the nearest vicinity to coals and to limestone, it may be stated that the iron ores and the iron manufactures of Pennsylvania are substantially to be the future iron ores and manufactured iron of the United States. Time may develop other modes of smelting, in which coals may not be the all important consideration, but no extensive manufacture of iron can now exist at any considerable distance from the coal fields of Pennsylvania, however rich and abundant may be the magnetic iron ores of the more southern States. And although, in Pennsylvania, the circumstance of the greater accessibility of the magnetic iron ores in the region of the Lehigh river, has hitherto appeared to confine the smelting of these ores to that particular quarter of the State, yet throughout the whole of the region between the Lehigh and the Schuylkill, the same ores can be mined where a demand for iron ore exists; and either at Easton, on the Lehigh, or at Reading, on the Schuylkill, iron furnaces can be supplied in any quantities, however illimitable, of magnetic iron ores, at an average cost of three dollars per ton.

These ores are the richest of all the ores of iron,—not the most productive of iron in the greatest quantities only, but the iron is of the finest quality which is thus made from the magnetic ores of the United States. From the same oxides of iron is produced all the fine iron of Russia, Sweden, and Norway,—countries which are situated in similar primitive geological formations with a large portion of the State of Pennsylvania,—and whilst the search has been in vain for magnetic iron ores in England, yet in the return to the House of Commons of the importations of iron for the late years of 1848–9, which was made on the motion of Sir John Guest, there is an entry of “1340 tons of chromate of iron from Norway and the United States.” There is every variety of iron ore to be found in Pennsylvania, from the richest oxides of Russia to the leanest carbonates of Wales.

But the magnetic iron ores have yet been comparatively useless to the iron manufacturer of Pennsylvania, and Russian and Swedish iron continues to be imported into the United States, although made from the same ores which lie in whole millions of tons on the granite rocks of the Lehigh. The only instance in which the magnetic oxides have been smelted without admixture with hematite ores, is mentioned by Professor Walter R. Johnson, in favor of the Stanhope furnaces, in New Jersey; and though the work of Professor Johnson is now of some ten years in date, yet is there no furnace at this time on the Lehigh river where pig iron is produced with any regularity, unless with considerably more than one-half of the softer hematite ores. There are, occasionally, reports of extraordinary success in the attempts which may be made at particular furnaces to smelt the magnetic ores alone; and, for a short time, there is pig iron in the markets which sells at prices very far over the usual anthracite iron, of which there is an instance at this time of such pig iron being sent from a furnace on the Lehigh to Sheffield, in England, for the steel manufacture

of a place which depends almost entirely on Russia and Sweden for the raw material of steel. Yet this successful smelting of the magnetic iron ores never long fails to be followed by some important damage to the furnace; and it is generally considered that it is not practicable to smelt iron with profit to the manufacturer, when using the magnetic oxides of iron, unless with the admixture of considerably more than one-half of the inferior hematite ore.

But this admixture of inferior ore is fatal to the manufacture of iron, on the Lehigh, or elsewhere in Pennsylvania, in competition with the iron of Russia; for the quality of the metal is deteriorated, and the expense is increased, of manufacturing iron from hematite ores, which are usually brought from considerable distances to the furnaces on the river Lehigh. Great quantities of hematite ores are annually sent round from the Schuylkill river to the furnaces in New Jersey, and this ore is sold at an average of one dollar per ton above the magnetic ores, an expense which is most needlessly incurred, from a supposed impossibility that the magnetic ores can be smelted alone.

To overcome this difficulty in the reduction of the magnetic oxides of iron is, therefore, of the utmost importance in the anthracite iron manufacture of the United States. Certain it is, that iron equal to that of Russia can be produced from the magnetic ores of Pennsylvania,—for the Exhibition of the Franklin Institute exhibited such iron in the late year of 1849; whilst the steel manufactured at the Adirondac works, in New Jersey, is also from American iron, and the iron recently produced at the largest furnace on the Lehigh river, is reported from the rolling mills to be fully equal to Russian or to any other iron, with respect to malleability, but that, in the process of puddling, a considerable per centage of its weight has been found to be lost. This latter circumstance may probably lead to the better management of the process of smelting the magnetic iron ores of the United States.

For, against the alleged impossibility of smelting a hard magnetic oxide of iron, there is the refutation in the daily practice of the iron founder, who melts the pig metal itself, and it will not be said that there is any iron ore which is harder than the pig. The practice of the iron founder may, therefore, point to the true modes of smelting the magnetic ores of the United States.

It is the absence of the waste alone—of three-quarters of the coals, and the limestone—which enables the founder to reduce the metal itself, which yet cannot be produced by the smelter from the yet much more reducible form of the ore.

There is no iron foundry in which more than five cwt. of anthracite coal is used for the smelting of one ton of pig metal, and yet the cupola furnace is blown with cold air, and loses immensely more heat by radiation than is lost from a smelting furnace through walls of many feet in thickness. But the iron founder does not use his coal in enormous lumps, of which the greater part is useless in the smelting process and lost in the air. Were the cupola furnace filled with lump anthracite coal, two tons would equally be required for smelting a ton of pig iron, as a ton of iron from ores which are almost all iron, for there is frequently 90 per cent of iron contained in the magnetic ores.

But though these ores are almost all iron, and the quantity of earthy adulterations less than in any other iron whatever, yet is there, in the iron furnaces on the Lehigh, no change or shadow of alteration from that everlasting "ton of limestone," which appears to be thrown into every iron furnace in every place and region in the United States. The founder uses only some small portion of lime, a few pounds of oyster shells being sometimes all that is used for melting a ton of pig metal of impure quality, but more frequently none whatever is used in the cupola furnace; and if the earthy ingredients in the ores be only 10 per cent., or 2 cwt. in the ton, then 1 cwt. of limestone is the true quantity to be used in the smelting furnace, the waste of limestone being one of the leading causes of the unsuccessful attempts to produce iron for steel from the magnetic ores of the Lehigh. The unusual waste of iron in the puddling furnace is owing only to the calcareous and carbonaceous concretions which remain from the excessive use of anthracite coals and of limestone in the smelting process, for the loss is not of metal, but of impurities which have been inserted in it, at a very considerable expense, and only to be again extracted by the further very heavy expense which attends all puddling of iron in the United States.

The chemistry of red short iron may not have been very clearly ascertained, and the phosphoretic substance which Bergman found on the analysis of one kind of iron, may not improbably be now sometimes mistaken for the metal of calcium, or of deoxydized lime, which may remain in the metal by the greater specific gravity which will cause its precipitation amongst the metal in the hearth; but certain it is, in all practical iron manufacturing, that pig iron is rendered the more brittle by the excessive use of lime, and this excess is most enormous throughout the iron manufacture of the United States.

In order to illustrate, from actual practice, the undoubted error of using this excessive and unvarying quantity of limestone in the American anthracite iron manufacture, it is here proposed to bring into notice the comparative quantities of limestone and other materials used, formerly and now, in Scotland, and under different temperatures of blast.

At the Clyde iron works, in 1831, the blast at 280° Fahr.

	tons.	cwt.
Coal for fusion, 1 ton;—18 cwt. of coke; in coal,	4	6
For the hot blast apparatus,	0	5
Blowing machine,	0	7
Limestone,	0	9

In 1833,—temperature of blast, 612°.

	tons.	cwt.
For fusion,	2	0
Hot air apparatus,	0	8
Blowing engine,	0	11
Limestone,	0	7

Here is seen a reduction of limestone to 7 cwt. per ton of pig iron, at a temperature of 612°, and this quantity is still in use very generally in Scotland, although the limestone of Scotland is only the mountain limestone which intervenes in the bituminous coal measures, and far inferior in quality to the transition limestone of the Schuylkill region, which approaches to almost perfect purity when taken from any low part of the stratum, and usually contains 94 per cent. of pure lime.

That the brittleness of anthracite iron is owing only to errors in its manufacture, is further rendered probable from everything that is known of the quality of the iron produced from hematite ores in other parts of the world. At Ulverstone, in England, iron is made with charcoal from hematite ores, and this iron possesses so nearly the soundness of the iron of Sweden as to be almost equally valuable in the market; nor has it even been doubted that hematite iron ore is second only in value to the magnetic oxides from a lower situation in the primitive rocks. The "ton of limestone" is the greatest misfortune that ever was imported into the manufacturing system of the United States

Besides the loss of anthracite coal, and of limestone, with all the injurious effects upon the metal which so arise from their use in excess, there would seem to be another important error in the filling of the furnaces with the magnetic oxides of iron, in an insufficiently reduced state. This variety of iron ore of a specific gravity proportioned to its great content of pure iron,—probably three times heavier than anthracite coal or limestone, or more than double the weight of the hematite or argillaceous iron ore with which it is intermixed so universally at the furnaces on the river Lehigh. The magnetic iron ore will therefore tend to fall, by its greater gravity, through and below the coals, the limestone, and the other ores in the furnace at the same time, lying impressed against the boshes, obstructing the blast, impeding its own reduction, and causing much of the superincumbent coal to be lost to the process of smelting and wasted at the tunnel head. The continual "chills" which occur at the furnaces which use any important quantity of magnetic iron ores, are probably to be much traced to that merely mechanical cause. The remedy for this obstruction is very easily to be found by reducing the magnetic ores to the smallest size,—as in Sweden the ores are always broken to about the dimensions of an ordinary egg,—and by filling also the furnace with the ores more intimately mixed with the limestone and the coals. The expense of the reduction of these magnetic ores to even very minute dimensions, by stamping machinery, would be amply repaid by the facility with which they would be smelted, with the greater quantity of iron which a furnace would produce, and the greater duration of the brickwork of the walls.

The internal form of the furnaces on the Lehigh, which are universally cylindrical, must be viewed as another impediment to the successful smelting of these heavy magnetic iron ores, which will press with increased force, by their greater weight, against the walls of a furnace with an imperfect internal curve. A chill of very great consequential damage has occurred recently at the furnace which was becoming known for the production of iron selling readily for \$26 per ton, against the iron of neighboring anthracite furnaces at \$19 per ton, and the furnace in question is of the cylindrical internal form. On the other hand, the Stanhope furnaces are true circles, according to Prof. Johnson; and he mentions, as with exultation, that these furnaces had reduced the magnetic ores without mixture with ores of any inferior kind.

These are the undoubted causes of the unsuccessful attempts to smelt the most valuable of all the ores of iron—the magnetic oxides of the Lehigh region; nor is there any truth whatever in the usual reasoning of the proprietors of iron works, that the use of the hot blast is the cause of the

difficulty in the production of iron for the purposes of steel. It has been settled long since, not more, theoretically, by the extensive series of experiments which were made by Messrs. Fairbairn and Hodgkinson, for the British Association for the Advancement of Science, than by the daily subsequent experience at all the principal iron works in Scotland, that there is no difference in the quality of iron made by hot air or by cold, or that the difference has been in favor of the hot blast system of smelting, a much larger increase of No. 1 iron having been produced at the Clyde iron works, by the same furnace and from the same materials, after the change to the use of heated air. The opinion that hot blast iron is inferior in quality has long since been exploded at all the iron furnaces of Great Britain, and the hot blast is assuredly not the cause of the inferiority of the great bulk of the anthracite iron of the production of the United States.

By the abandonment of the present very rude and unreasoning modes of building, of filling, and of blowing the iron furnaces of Pennsylvania, it would very soon cease to belong to the serfs of Russia to supply the finest of iron from underneath the snows of the Ural mountains, to all the rest of the nations of the modern world. This occupation is very clearly destined to belong to the people of the United States, for all the rarest of the oxides of iron are to be found in the primitive mountains of the Atlantic States, and to use these treasures on some system approaching to the resemblance of mechanical and chemical science, is all that would appear to be required to the early and entire ascendancy of the iron and steel manufacture of this quarter of the world,—for there would be no difficulty in smelting magnetic iron ores were the process conducted on any reasonable plan, and when not pig iron only, by the founder, but Russian and Swedish bars, by the manufacturer of steel, and even cobalt, is reduced daily, (although this is amongst the most refractory of all the metals,) it follows that there is no iron ore whatever which cannot be reduced with the greatest comparative ease.

On the supposition that the magnetic ores have only been neglected or disused from causes which the improvement of the general iron manufacture may cause to pass away, then as the deposits of magnetic ores are shown to be boundless for any possible requirement for future manufacturing purposes, a chain of remarkable consequences may be seen to follow the establishment of iron and steel manufactures in the regions of these ores; for not only may the finest of iron be made in any possible quantities in Pennsylvania, but the most valuable of all the varieties of iron may come to be made at a less expense than the worst. One ton of magnetic iron ore will produce more metal than two tons of ordinary hematite, or than three tons of carbonate of iron, whilst the expense of mining the richest will not be greater than the leanest of the ores; and thus may all other smelting become unprofitable in any other regions but those which contain the ores of the original rocks. Russians, Norwegians, and Swedes would then cease to be the sellers of all but inferior iron to such nations as Great Britain and the United States; and as the British islands possess a geology not within the probabilities of any deposits of iron ore of a class superior to the hematites, the State of Pennsylvania and its anthracite coal regions would appear to be destined to take a very high rank in the future manufacture of iron for the world at large.

But this only can be the result of the most economical use of the iron ores of the finest quality, since the difference is daily becoming less in favor of any particular nation in any particular pursuit of manufactures or of foreign trade. Navigation is cheapened and more expeditious from year to year, and the freight of commodities is daily lessened over the sea. The difference in favor of the American iron manufacturer would be only the expense of conveying magnetic iron ore from the Lehigh to Scotland or to Wales, as the chromate of iron is now taken to Great Britain from Maryland at Havre de Grace, and the cost of the freight is comparatively less, the more valuable may be the ores which may yet come to light from the primitive mountains of the new world. Specimens of both meteoric iron and of specular iron ore were recently shown to the writer of these observations, by proprietors of iron furnaces on the Lehigh river, and when the non-volcanic character of the region is preserved in view, and reflecting that the specular iron ore is in entire hills in the Island of Elba, in the Mediterranean Sea, that the laws of comparative geology render probable the existence of the same ore in continuity of deposit in the places where it has been found at all, consequently that hills of specular iron ore may be found in the regions of the Schuylkill, the Susquehanna, the Lehigh, or any other part of the long line of country which is traversed by the primitive mountains of the United States; and that in the present wasteful use of anthracite coal, and of limestone, it might be considerably less expensive to carry the specular iron ore to Scotland than the coals from Pottsville to Reading or the Lehigh. Such considerations render indispensable an equality in the art of smelting iron, in order to the preservation of the local advantage of the possession of the finest of ores. As Scotland, with advantages so inferior, still continues so strangely to supply the lower qualities of pig iron, so will it be not any very long time before the same people will be in possession of the manufacture of the higher varieties of iron, unless upon the rise of a more formidable opposition than any which yet can be discovered in the science of the iron manufacture of the United States. There is no mode of now maintaining an ascendancy but by the skill and enterprise of nations. Geology, chemistry, and mechanical science are rapidly assisting many nations to become rich from resources which were not formerly supposed to have an existence; and though the position of Pennsylvania is that of so undoubted an apparent magnificence, amidst the mineral deposits of so many valuable kinds, yet, without more rapid improvements in their use, neither the magnetic iron ores nor the anthracite coal fields appear to be destined to increase very materially the wealth and the commercial ascendancy of the Republic of the United States.

For the Journal of the Franklin Institute.

Fresh Water in Marine Boilers.

Much time and money have been wasted in vain attempts to perfect, for marine engines, a condenser that, while it would maintain a good vacuum, would also allow the condensed steam to be returned to the boilers as pure as it came from them. Of all those which have as yet been offered

to the public, that of Hall has met with the most success, or has at least been practically introduced into several steamers in England, where it was thought it would work a revolution in the economy of the marine engine. But although at first it gave much satisfaction, it was soon found to have defects which became of such a serious character as, in a short time, to almost, if not entirely, prevent its use. It was very expensive in its first cost, and, after short use, the tubes would leak and cause the water in the boilers to become salt; and, in addition to this, the tubes being vertical, the water from the steam first condensed was obliged to pass through the whole length of them, and as it adhered to their surface on its passage, their conducting power was much injured.

Since then, Mr. Howard, of England, has brought forward a refrigerator for cooling the injection water. By his arrangement the steam was condensed by a jet as usual, and then the condensed steam and water of condensation were made to flow through a large number of small horizontal tubes, having a current of cold water on their external surface. By this means the injection water was sufficiently cooled down to be again used. Although the arrangement possessed considerable merit, still it failed to succeed, probably from the liability of the tubes to leak from their constant contraction and expansion.

Several persons, in this country and in Europe, have brought forward fresh water condensers, but most of them have been modifications of Howard's arrangement, although they condense the steam, while he cooled the water, yet, in construction, they are the same or nearly so. They all have defects, or at least all that have yet been publicly tested have. The objections are, liability to leak, and by that means destroy not only their efficiency as fresh water condensers, but also to affect the vacuum. The requisites of a good condenser of this kind are, first, instant condensation, so that the ordinary vacuum may be maintained; second, impossibility of derangement, or as much security as the ordinary condenser allows.

The advantage of such an apparatus would soon be appreciated and generally adopted, but until it has been put successfully in practice, few if any of our steamers would venture to use it. With them success is of great importance, and, rather than risk partial failure, they will adhere to the old and well-tried condenser of Watt. But when at least 10 per cent. in fuel, besides the wear of boilers, may be saved by an apparatus that will answer the requirements above stated, I hope some of your numerous readers will take the subject in hand. Z.

For the Journal of the Franklin Institute.

Improvements in Sugar.

We were shown, a few days since, some samples of sugar made on the plantation of Messrs. Benjamin & Packwood, near New Orleans. These gentlemen have one of Rillieux's Patent Three-Pan Sugar Boiling Apparatus, and the sugar is made directly from the cane. Two of the samples were of white sugar, *crushed* and *flour*, and the third of molasses sugar. Their white sugar will compare favorably with that from our northern refineries, and has been pronounced by Professor M'Culloch, in his report,

as equal in chemical purity to Lovering's single refined. From 12,000 to 15,000 lbs., of the white is produced daily, besides working over the molasses, which produces a sugar but little inferior to the best. We are also informed by Messrs. Merrick & Son, who are the agents for the apparatus, that, in consequence of its success, they have recently shipped one to the Island of Cuba, and are now building two for Mexico, the largest of which is a duplicate of that used by Benjamin & Packwood. In consequence of the quiet state of affairs in Mexico, several gentlemen there are turning their attention to the cultivation of sugar cane for home consumption, as the very expensive land carriage will prevent exportation.

B.

For the Journal of the Franklin Institute.

Economy of the Steam Engine.

The great expense of steam power is the cost of fuel, and although we cannot reduce the price per ton, which is regulated by its market value, we can readily reduce the number of tons used, by paying proper attention to the following items of loss.

1st, Insufficiency of power produced by having an engine too small for the work to be done, or boilers too small for the engine, but generally from both these causes combined.

2d, Imperfect setting of the boilers.

3d, By radiation: the tops of the boilers often being uncovered, and the steam pipes and cylinder nearly always so.

4th, By ignorance: the persons who have charge of many of our stationary engines being entirely unfit (by their want of knowledge of the principles of the engine) to keep all the parts properly adjusted.

The above are the principal causes of loss, and I shall, in your next, show the remedy, and adduce examples to prove the truth of my remarks.

W.

*Means of Preventing Boiler Explosions. By A. C. JONES, Esq., Civ. Eng.**

The recent explosions of steam boilers in this vicinity have brought out many contrivances, and revivals of old plans to *prevent* explosions. After it was *conceded* that high pressure steam boilers could be worked safely with proper care, then came various plans to make them *safer*. First on the list was lead plugs, riveted into holes made in the boiler sheet above the fire surface; next came fusible alloys, which would melt at a slight increase of temperature above that equivalent to the pressure of the steam in the boiler. Fusible alloys have entered into a large variety of arrangements for preventing explosions, by the order of the French Government; and also by the Committee on Explosions of the Franklin Institute, numerous experiments were made with alloys. We have had advocates for "Floats," "Balance Valves"—using the expansion of mercury, and rods of copper, arranged so as to open valves to permit the steam or water to

* From the New Orleans Daily Crescent, November 22, 1849.

escape and extinguish the fire, etc.—“Tell-tales,” Whistles—looking at a steam boiler and calling it inspection—Lock-up safety valves, and a host of other things, mostly mechanical; and, in the wish to make the boiler *take care of itself*, almost entirely overlooking an article called *brains*, or, if you please, intellect.

In my time, persons having charge of steam engines were *engineers*—being paid such salaries as would command the best talent of the profession, and they had the sole control and management of the engines and boilers. How is it now? With some honorable exceptions, the pay of the engineer (I give the title) is a mere pittance, and he is in many cases a mere machine in the hands of the captain; and as a young man, of little experience, is more pliant than one that understands his business thoroughly, the latter is crowded out. Again, there is a class of men who are continually changing from one boat to another, and they endeavor to make better time than the trip before; all defects in the working of the engines by this class, is remedied by increasing the pressure of the steam.

Many prudent engineers, who understand their business, have been discharged for not increasing the head of steam in the boilers at the command of the captain. I will give a case in point, I am personally acquainted with a Mr. S., one of the best practical engineers, (now carrying on a large steam engine establishment in Philadelphia,) who was so discharged some years since, from a boat on the Mississippi river, *and on her return trip the boilers exploded!!*

Having had, during twenty-five years, much practical experience in working with nearly all the varieties of steam boilers, and having also paid much attention to those which have come under my notice after an explosion, I am satisfied that, in the greater number of cases, the explosion of the boiler was caused by gross neglect or ignorance on the part of those having charge of them. I, like other engineers, have had boilers at different times, under circumstances in which all the elements necessary for an explosion were present, but never had one to occur.

I will now give a few directions, (the boilers being assumed to be strong enough to bear the usual working pressure with safety,) which are invaluable to the young engineer, as they have carried others, beside myself, safely through a long practice. Of course these do not include everything necessary, but are of primary importance:

1st, Carry the water* as high as the boiler will allow, without working over into the cylinder.

2d, Never increase the pressure of steam to overcome the loss of power by leaks in the joints, derangement of the valve gear, etc.

3d, If, when at a landing, by any unforeseen cause, your water should get *too low* in the boiler, AVOID PUMPING IN WATER, OR RAISING THE SAFETY VALVE SUDDENLY, or by any other means disturbing the smooth surface of the water, kept so by pressure, *but dampen the fire at once*, and allow the boilers to cool down below their working temperature; after this is done, if time is an object, you can throw in a *very* small quantity of water, and

* Over eighteen years since, at Philadelphia, I stood *alone* as an advocate for carrying water high in the boilers, in opposition to the theory inculcated by English books, (written by arm-chair engineers,) of the necessity for a large space for steam room. I have experimented much on this matter, and still recommend carrying high water; and I have the satisfaction *now* of knowing that this is the practice of the best engineers of the country.

note its effect on the safety valve, and if sufficient time has elapsed, the lever of the safety valve will get heavier; in this case, you can set your pump to work and start a slow fire, limiting your supply of water, so as not to cool the boiler too soon and cause leaks. Do not confound this *decrease of pressure* with that which is caused by an excess of temperature, for you will find, by experimenting with an iron ladle heated to redness, that, by throwing in it small quantities of water at stated intervals of time, as it cools and gets black, there is a point of temperature at which the water is flashed instantly into steam, and *if it is your boiler which is at this degree of heat, and a sufficient quantity of water is thrown in at one time, an explosion is inevitable.*

To close this already long article, permit me to suggest (what will be considered an innovation by many here) that the furnace ends of the boilers be *aft*, so that the engineer on duty may have the firemen under his eye, and see the exact state of the fire at all times, instead of, as it is at present, conveying his orders through a tube and guessing how the fires are. Many will say that he can see by walking (from 30 to 40 feet) to the *hole* in the cotton bales, etc., forming part of the deck load; by doing this, he then has to break what should be the rule of every good engineer, "never to go out of sight or hearing of his engine."

If I have not overtaxed your space, I may at some future time make some remarks on the futility of some of the proposed safety plans connected with this important subject.

For the Journal of the Franklin Institute.

Steam for the Andes.

An iron steamboat of small size has recently been built by Mr. George Birkbeck, Jr., of New York, which, from its destination, merits some notice. The boat is 55 feet keel, 12 feet beam, and 5 feet hold. She is to be propelled by two high pressure engines of 10-horse power each, connected at right angles. Water wheels 10 feet diameter, and of wrought iron. The whole being fitted together in New York, and each piece marked before being shipped. No piece is to exceed in weight 350 lbs., as, on its arrival at Lima, it has to be transported on the backs of mules to its destination, Lake Titicaca, which is situated near the summit of some of the highest mountains in that country, and several miles above the level of the sea. As yet, commerce must be in its infancy in that elevated region, but the lake is 140 miles long, and its coast well timbered, and it is understood that much traffic would be the result of increased facilities. In case the first boat succeeds, a larger one is to be sent out immediately.

B.

*Photography on Paper.**

At the Paris Academy of Sciences, M. Regnault presented, on behalf of M. Blanquart Evrard, of Lille, several specimens of photography on paper, obtained by means of a matrix on albumen, rendered sensible to the action of light by its admixture with the aceto-nitrate of silver, and spread

* From the London Artizan, for October, 1849.

in a thin layer on a plate of glass. The new matrices obtained by means of the preparations which M. Blanquart Evrard describes in his communication are unalterable to the light; lose none of their qualities however long the time they may be used; are capable of being renewed if by accident they should be lost, provided that one proof of the lost matrix remains; and lastly, can, at all times, and under all temperatures and variations of light, furnish satisfactory results. The following is the mode of preparation indicated by M. Blanquart Evrard:—

Collect in a deep vessel a certain number of whites of eggs—remove the whole of the solid or non-transparent part, and take care to protect it from dust; add 15 drops of a saturated solution of iodide of potassium; beat the eggs into a froth, and allow it to settle until the froth returns to the liquid state. Clean the glass which is to be employed with spirit of wine, place it on a support, beyond which the edges of the glass may project, and pour over it a sufficient quantity of albumen; spread this albumen over the whole surface of the glass, employing a piece of glass for this purpose, the edge of which comes in contact with the surface of the glass. This operation must be repeated several times, its object being to cover the surface of the glass with a perfect coating of albumen, so that it may remain well covered when hung up by one of its corners to drain off the excess of albumen.

After this last operation, the glass is placed quite flat and allowed to dry. The albumen having been well dried, the glass is submitted either to a very high temperature, or to what amounts to the same thing, to a very low temperature, until the layer of albumen presents an uniform croched surface. Care, however, must be taken that this part of the process is not carried too far, lest the albumen should peel off. The glass having undergone this preparation, must next be submitted to the action of a solution of aceto-nitrate of silver (of the strength indicated in the communication of the 20th of January, 1847); care must be taken that the contact of the aceto-nitrate with the albumen shall be effected at one operation, for if the glass were several times immersed in the solution, different layers would be formed, arising from the contraction which the albumen undergoes on its combination with the aceto-nitrate. This part of the process may be accomplished most readily by proceeding as follows:—In a basin, a size larger than the albumenized glass, is put a solution of aceto-nitrate of silver, to the depth of a quarter of an inch; an inclination of 45° being then given to the basin, the edge of the glass is placed in the solution, the albumenized side towards the bottom of the basin; then, by a simultaneous movement, the glass is allowed to fall in the basin and the basin to regain its horizontal position on the table. This done, the glass is immediately removed from the basin, immersed in a basin of water, and briskly stirred for several seconds, and lastly drained by holding it by one of its corners and striking the opposite one briskly on the table. Glass thus prepared, becomes completely photogenic. It may be employed indifferently either in a moist or a dry state, if it be required for use at a distance or on a journey. The impression may even be made to appear after exposure to the camera obscura, either immediately or after a return from a journey. This operation is performed (as M. Blanquart Evrard has already indicated for paper in his communication to the Academy in November, 1847,) in

a bath of a saturated solution of gallic acid; it will, however, be useful, in order to give the impression a full effect, to add a little aceto-nitrate of silver to the solution of gallic acid. It will be prudent to withdraw the impression from its immersion in the gallic acid before its different parts acquire the tone desired, for if the action be pushed too far, the deep tones it then presents cannot be afterwards diminished; whereas, on the other hand, if the shades are too faint, the impression may, without danger, be again subjected to the action of the gallic acid, notwithstanding the matrix had already been served to produce a great number of impressions. After this operation, the glass should be washed in a large quantity of water, then dipped into a solution of bromide of potassium, (20 parts to 100 of water,) and lastly again washed in a large quantity of water, and dried in a darkened room in an horizontal position. Treated in this way, the albumen on the glass acquires such a degree of hardness and solidity, that when it is required to destroy an incomplete impression, in order to use the glass again, it is necessary to have recourse to a very powerful chemical agent, such, for instance, as the cyanide of potassium, to remove the coating of albumen.

*On Copper containing Phosphorus, with details of Experiments on the Corrosive Action of Sea Water on some varieties of Copper. By DR. PERCY.**

Upon analyzing a specimen of copper to which, when in a state of fusion, some phosphorus had been added, it was found that it contained a considerable quantity of phosphorus, and also a large portion derived from an iron rod employed in stirring the mixture at each addition of the phosphorus. The copper employed was of the "best selected;" it appeared to be harder than copper treated with arsenic. The details of the analysis of 116·76 grains was given, the result of which was—

Phosphorus,	.	.	.	.	.	0·93
Iron,	.	.	.	.	.	1·99

A second analysis gave—

Copper,	.	.	.	.	.	95·72
Iron,	.	.	.	.	.	2·41
Phosphorus,	.	.	.	.	.	2·41
						<hr/> 100·54

It has long been stated that a very small quantity of phosphorus renders copper extremely hard, and adapts it for cutting-instruments—but such an alloy as that formed by Dr. Percy has not previously been formed. It is a remarkable fact that the presence of so large a quantity of phosphorus and iron should so little affect the tenacity and malleability of the copper. The effect also of phosphorus in causing soundness in the casting of copper is interesting, and may be of practical importance.

Remarks.—Captain James, superintending engineer at the Woolwich dockyard, said that the rapidity with which copper sheathing sometimes decays was surprising; in five months it sometimes decays completely. Some of the old copper had lasted forty years; and, for the purpose of de-

* From the London Civil Engineer and Architect's Journal, for November, 1849.

termining the cause of this difference, he made a series of experiments on all the copper which had been used in her Majesty's dockyard. By steeping these different coppers in salt water for nine months, a series of actions set in, which, by subsequent weighing, were accurately determined. The following table exhibits the results of these experiments:—

	Grains.
Electrotype copper, loss per square inch,	1.40
Selected copper,	1.10
Copper containing phosphorus,	0.00
Copper from the "Florin,"	1.12
Dockyard copper, No. 1,	1.66
Ditto No. 2,	3.00
Ditto No. 3,	2.48
Ditto No. 4,	2.33
Muntz's metal,	0.95

Mr. Phillips inquired if the specimens were wholly exposed to the water, or were only partially exposed, so as to allow the action of air, as in the latter case the chloride of magnesium in sea water would give rise to the formation of an oxichloride, but which would not be formed if air were absent. Captain James said they had been wholly immersed.—*Proc. Brit. Assoc.*

*Method of Regulating the Flow of the Injection Water into the Condenser, applicable principally to Marine Engines. By G. J. CUNNACK.**

The injection water, as is at present the general practice, being allowed to flow into the condenser in an uninterrupted stream, and requiring the constant attention of the engineer, so as to proportion the quantity of injection to the bulk of steam proceeding from the engine, this latter must be subject to great variation, particularly in the case of marine engines when the paddles are exposed to a heavy sea, which at times almost brings them to a stand-still; and, as the injection water still flows, the air pumps become subjected to a severe strain resulting from the partial choking produced by the excess of water. On the other hand, should the speed of the engines become accelerated, and the injection remain unaltered, a loss of power must ensue from imperfect condensation.

The manner in which it is proposed to remedy these irregularities, is by causing the difference of pressure in the condenser to act on a throttle valve in the injection pipe, similar in construction and effect to the one in the steam pipe connected with the governor in land engines. A small cylinder of any requisite diameter, open at the bottom to the condenser, and at the top to the atmosphere, is fitted with a piston, the rod of which is connected by means of levers, on the one side with a balance or spring, and on the other with the governing lever of the throttle valve in the injection pipe. The lower end of the cylinder being open to the condenser, the piston will be subjected to the pressure arising from the vapor within it, this being usually computed at 5 lbs. per square inch; the atmosphere acting on the top of the piston with a force of 15 lbs. to the inch, would leave a force tending to depress it in the cylinder of 10 lbs. A weight, acting

* From the London Artizan, for December, 1849.

by means of the long lever, is so arranged as to compensate for this difference, and keep the piston in equilibrium so long as the pressure in the condenser remains at the proper point, namely, 5 lbs. to the square inch.

Supposing that, from an insufficient supply of injection water, this pressure should be exceeded, the piston will rise, and lifting with it the end of the lever connected with the throttle valve in the injection pipe, will increase the flow of water and produce the required effect of more perfectly condensing the exhaust steam. On the other hand, should the flow become too great, so as to carry the amount of rarefaction too far, the piston would be depressed from the preponderance of atmospheric pressure, and the action on the throttle valve would be reversed, so as to diminish the quantity of water flowing through it. The piston, not being exposed to the action of heat, can be easily kept air tight by a packing of soft leather, and, if necessary, a small quantity of oil kept on the top of it would be an additional security against leakage. There is a spring in the cylinder, to prevent the too sudden rise of the piston, and ensure its gradual action on the throttle valve of the injection pipe. The latter valve is supposed to be placed between the injection cock and the condenser.—*Proc. Roy. Cornw. Polyt. Soc.*

For the Journal of the Franklin Institute.

Performance of the Steam Ship "Philadelphia."

I send you the performance of this ship, as taken from her log-book, during her recent trip to Havana, via Charleston and Savannah. She left here on the 20th December, at noon, and made Cape Hatteras in 27 hours, with an average pressure of 16 lbs. of steam, cutting off at one-third; revolutions per minute, 15. After passing the Cape, the wind came ahead and soon increased to a gale of great force, and blew for 24 hours, when it gradually fell off. During the gale the engines were worked at full stroke, and the pressure kept at 15 lbs.—engines making 9 and 10 revolutions per minute. The severity of the gale may be imagined, when the distance of 70 miles was all that could be made in 22 hours. The wind continued ahead for the balance of the distance to Charleston,—time from dock to dock, 76 hours.

The ship remained at Charleston four days, being two days more than was intended. This was found necessary, as the pipes to the brine pumps, and also the blow-off pipes from the boilers, were known to be partially obstructed; and, on examination, small pieces of wood and other refuse matter (which must have been left in the boilers) were found and taken out. She left Charleston on Friday, the 28th, and Savannah on the 29th, for Havana, and the run from port to port was made in 69 hours. Several hours were lost on this passage from keeping too far out from the shore, and thus having a portion of the Gulf Stream to contend with; still, as this was the first trip, it was perhaps more prudent to do so.

She remained at Havana until the 10th of January, and while there took on board 50 tons of Scotch bituminous coal. On the return trip to Savannah, it was found that it required $1\frac{2}{3}$ tons of that coal to give the same effect as 1 ton of anthracite coal, her usual consumption being 1 ton of the

latter per hour. The run from Havana to Savannah bar was made in 49 hours, which is as quick a passage as has ever been made. The run from Savannah bar to Charleston bar was made in 6 hours, and from Charleston to Philadelphia in 65 hours from wharf to wharf. Although she had never been at sea before this her first trip, and had been only tried for a few hours in the river, yet she was ready on her arrival for any voyage.

Since her return she has been sold to Messrs. Howland & Aspinwall, at an advance of \$25,000 on her cost, and takes her place in their California line, via Chagres, from New York, on the 7th of this month. On her trip round to New York, she made the distance from Sandy Hook to the East River (18 miles) in 1 hour and 15 minutes, and her appearance is very highly commended by the press of that city.

The builders of the "Philadelphia" will probably now construct a vessel somewhat smaller than her for the Southern trade, which, in connexion with the "Osprey," now belonging to them, will form a weekly line South.

W.

On the Preservation of Water. By M. PERINET.*

M. Perinet, ex-Professor of the Hôpital Militaire d'Instruction, has succeeded in preserving water in a sweet state, by placing $1\frac{1}{2}$ kilogramme of black oxide of manganese in each cask of water containing 250 litres. He has kept this water for seven years in the same barrels, and exposed them to various temperatures; at the end of that time he found it as limpid, free from smell, and of as good a quality, as at the beginning of the experiment. The above is equal to $6\frac{1}{2}$ lbs., to a butt of 108 gallons.

On the Influence of Boracic Acid on Vitrification.†

M. Maes, manufacturer of flint glass, has, conjointly with M. Clemandot, long paid attention to the above-named subject. The principal results hitherto obtained are:—1st, borosilicate of potash and lime; 2dly, borosilicate of potash and zinc; 3dly, borosilicate of potash and barytes; 4thly, borosilicate of soda and zinc.

The borosilicate of potash and lime was formed with the intention of producing in close vessels with coal furnaces, the best imitations of Bohemian glass. In the *Compte Rendu de l'Exposition Autrichienne*, 1845, published by M. Peligot, it appears that, in order to make the purest and most durable glass in Bohemia, they use with 100 parts of silica, 12 parts of unslaked lime, and only 28 parts of carbonate of potash. From this we must conclude that the glass is better the less potash and the more lime it contains.

The above proportions yield a glass which is infusible in the furnaces employed by M. Maes. The addition of a few hundredths of boracic acid is sufficient to occasion fusion, and the resulting product possesses all the limpidity, splendor, and hardness which can be desired.

This first experiment naturally suggested the advantage which might be derived from the solvent power of boracic acid, so as to introduce bases

* From the London Civil Engineer and Architect's Journal, for September, 1849.

† From the London, Edinburgh, and Dublin Philosophical Magazine, for December, 1849.

into glass which had not hitherto been employed, as borosilicate of potash and zinc, and that of potash and barytes. The borosilicate of potash and zinc appeared to impart all the qualities of a pure and durable glass. As to the borosilicate of potash and barytes, it was prepared from native carbonate of barytes, contaminated with sulphate of barytes and a ferruginous gangue. If then it be less colorless than the zinc glass, the color is certainly accidental; on again making it with pure carbonate, this imperfection would unquestionably disappear.

The beauty of borosilicate of potash and zinc led to the comparative trial of borosilicate of soda and zinc; this, although inferior to the potash, incontestably excelled all the soda glasses compared with it.

To recapitulate: the borosilicates are chiefly remarkable for their transparency and hardness. They derive these important qualities from reducing considerably the potash and soda, which almost always are in excess in common glass; and every one knows that glass which is too alkaline, is cloudy, soft, and hygrometric.

These observations, in the opinion of the author, warrant the conclusion, that boracic acid must before long contribute to the perfection of glass for optical purposes, and M. Maes proposed to prepare borosilicates of great density, with lead, bismuth, &c., besides barytes.—*Compt. Rend.*, Oct. 22, '49.

*Analytical Investigations of Cast Iron. By MR. WRIGHTSON.**

The analysis showed the influence of the hot blast in producing the so-called "Cold Short Iron," by occasioning an increased reduction of phosphoric acid, and the consequent increase of phosphorus in the "hot blast" iron. The respective per centages were—

	1	2	3	4	5	6	7
Cold Blast,	0.47	0.41	0.31	0.20	0.21	0.03	0.36
Hot Blast,	0.51	0.55	0.50	0.71	0.54	0.07	0.40

The irons differed also considerably as to the state in which the carbon was contained in the hard white iron, resembling impure steel, containing nearly all its carbon in a state of chemical combination, whilst the carbon contained in the grey and mottled varieties of iron was principally contained only as a mechanical mixture. The presence of sodium and potassium in all the specimens examined was also noticed for the first time, and it was thought probable that these might materially affect the qualities of the metal.

Remarks.—Mr. Phillips pointed out the loss of carbon, which, in the method described, would arise from the use of hydrochloric acid, giving rise to an oily product; to which Mr. Wrightson replied that he had determined the carbon by an independent method. The President inquired if Mr. Wrightson had sought arsenic in all his analyses? Mr. Wrightson replied that he had not found it in some, and did not, in consequence, look for it in the others. The President objected that it was as important to determine the absence as the presence of so important an element as arsenic. In reply to an inquiry, he said that, in examining the slags of furnaces in many countries, he had only discovered phosphoric acid in one from Belgium.—*Proc. Brit. Assoc.*

* From the London Civil Engineer and Architect's Journal, for November, 1849.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, January 17th, 1850.

Samuel V. Merrick, President, in the chair.

Thomas Fletcher, Vice President.

Isaac B. Garrigues, Recording Secretary.

John F. Frazer, Treasurer.

The minutes of the last meeting were read and approved.

Letters acknowledging donations were read from the Royal Institution, the Royal Institute of British Architects, and the Statistical Society, of London, and the Royal Irish Academy, Dublin.

Donations were received from the Society of Arts, the Statistical Society, and the Royal Astronomical Society, London; Hon. Joseph R. Chandler, U. S. Congress; R. P. Anderson, Esq., Washington City, D. C.; Lieut. M. F. Maury, U. S. Navy; Thomas H. Forsyth, Esq., and Benj. Matthias, Esq., Senate of Pennsylvania; Franklin Peale, Esq., and Thomas J. Weygandt, Esq., Philadelphia.

The periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement of receipts and payments for the month of November, and also his annual statement for the year 1849.

The Board of Managers and the Standing Committees reported their minutes.

The annual statement of the Committee on Publications was read.

The Committee having charge of the arrangement of the Geological Specimens presented their report, which was read.

The Committee on Exhibitions presented their report on the application of Messrs. Charles Harkness & Son, and were discharged from the further consideration of the subject.

The Trustees of the Elliott Cresson Medal Fund presented their report, in which they recommend the following resolution, which was adopted:

Resolved, That the Institute will award the Elliott Cresson Medal, struck in silver, for such articles of African production, grown or made by the Pennsylvania settlement in Liberia, as Elliott Cresson, Esq., may designate, according to the terms proposed in his letter of the 12th inst.

An application was made for permission to make extracts from the reports of the Judges on Books and Stationary at the Exhibitions of 1848 and 1849, which was not granted.

On motion, it was

Resolved, That the Committee on Exhibitions be requested to issue to Mr. Charles Harkness & Son a First Premium, for the best lot of ready-made Clothing at the last Exhibition.

Resignations of membership in the Institute were read and accepted (2).

New candidates for membership in the Institute (12) were proposed, and those proposed at the last meeting (22) were elected members of the Institute.

The Tellers of the Annual Election for Officers, Managers, and Audi-

tors, for the ensuing year, reported the result of the Election, when the President declared the following gentlemen duly elected:—

SAMUEL V. MERRICK, *President*.

Thomas Fletcher, } *Vice Presidents*.

Abraham Miller, }

Isaac B. Garrigues, *Recording Secretary*.

Solomon W. Roberts, *Corresponding Secretary*.

John F. Frazer, *Treasurer*.

MANAGERS.

Matthias W. Baldwin,
Frederick Fraley,
John Agnew,
John Wiegand,
Samuel Hufty,
John C. Cresson,
Andrew M. Eastwick,
Ambrose W. Thompson,
Thomas U. Walter,
John H. Towne,
Edwin Greble,
David S. Brown,

Thomas S. Stewart,
Owen Evans,
Cornelius A. Walborn,
Alan Wood,
John E. Addicks,
Williams Ogle,
Asa Whitney,
Isaac S. Williams,
William E. Morris,
Edmund Draper,
James P. Ellis,
Robert P. King.

AUDITORS.

Stephen Byerly,
Joseph Cresson,
Algernon S. Roberts.

Prof. Cresson described to the meeting the plan of a new gas-holder, of 140 feet diameter by 70 feet high, (being the largest hitherto made,) which is in progress at the Philadelphia Gas Works. It is on the telescopic plan, and will afford a more economical and convenient stowage for gas than those heretofore erected. Some discussion took place among the members respecting the details.

Some specimens of Rolled Zinc, of exceeding thinness, made from the Calamine of New Jersey, were shown by the Chairman, which led to a discussion as to the pureness of the Zinc. The President, Mr. Merrick, referred to the first introduction of Zinc, as the base of a white paint, in this city, to the year 1820.

Some remarks were made by the Chairman respecting the wooden Railroad Bridge in progress on Market street, the centre span of which exceeds 200 feet. Numerous instances were cited of the failure of wooden bridges of large span, in this country and in Europe. The engineer of this bridge not having arrived with the drawings, the discussion was postponed until the next meeting.

Mr. Elliott Cresson exhibited samples of Palm Oil, Syrups, Camwood, &c., the production of the colony in Liberia.

The Chairman introduced the subject of Sandstone and other building materials, and adverted to the causes of destructibility and durability respectively,—the methods which have been resorted to to protect them,—the varying degrees of success attending such efforts, and described the me-

thods resorted to by nature in the formation of Limestone and Sandstone, both calcareous and silicious, and the mixture of both. He described some methods which he had devised for the purpose of imitating the natural production, as well as of increasing the tenacity and durability of building stone, otherwise too weak for use in its natural condition. Some specimens which had been treated by him were then exhibited. They had been wetted repeatedly by carbonated water, holding carbonate of lime in solution; other specimens had been wetted with carbonated water, holding carbonate of magnesia in solution, and others with limewater. The lateness of the hour rendered it necessary to postpone further remarks until next meeting.

BIBLIOGRAPHICAL NOTICE.

Encyclopedia of Mechanics, Engine-Work, and Engineering. OLIVER BYRNE, Editor. New York: D. Appleton & Co.

The first number of this new work, which, in our July number, we called attention to as about to be published, we find lying upon our table.

It is neither easy nor safe to pronounce an opinion upon a work so extensive as this must necessarily be, from its first number alone, but we can safely and with great pleasure say, that the number before us even surpasses the high expectations which we had formed of its usefulness. The articles are, where the subject appears to require it, full and explicit, the matter evidently carefully prepared, and the style terse and perspicuous, so that what is to be said, is said in the fewest and plainest words in which the sense can be fully expressed. We had no doubts, at first, as to the competency of Mr. Byrne to edit such a work, and had it been otherwise, the articles in this number would have been sufficient to demonstrate his ability. The principal articles in this number are upon "Animal Matter used in the Arts," and upon the Croton Aqueduct. The former is a description of the various processes used in the preparation of useful and ornamental articles from shell, horn, and ivory, and contains a great deal of very interesting and, to most of its readers doubtless, new matter. The latter, which is not yet finished, is a highly interesting description of the great work of art undertaken for the purpose of supplying the city of New York with water,—a work well worthy of being made known, from the magnificence of its conception, the excellence of its workmanship, and the success of its design. He who takes an interest in American works and inventions will find in this number several very interesting articles, giving promise that the work will be an American publication, and not one of those mere re-issues by which European statements, undervaluing our labors and assigning our inventions to others, are disseminated among our people. We refer our readers to the work for the descriptions of Kennedy's Air Pump, Otis' Steam Dredging Machine, and Roebling's Wire-Suspension Aqueduct. The work is well printed, and illustrated with wood cuts, and if it is continued in the style in which it has been commenced, will be highly creditable to the publishers and the country. We hope it will be so, and propose to notice it again hereafter, as we may find occasion.

Ed.

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

MARCH, 1850.

CIVIL ENGINEERING.

*American Engineering.—Locomotives.**

[It is only by collecting and comparing what has been done in various countries, that perfection, or anything approaching thereto, is at all attainable in any profession. Different circumstances and localities develop each one its own peculiarities; and to these primary causes is to be added the effect of the application of numerous and varied mental powers in concentration upon one subject. We make these remarks as an introduction for the present article on American locomotives, by Mr. Passavant, formerly of Bradford, the author of the two practically valuable contributions to this Journal, "On the Construction of Locomotive Engines," given at pages 76 and 99, *ante*. Since the date of the appearance of these articles, the author, now of New York, has had the opportunity of visiting and examining the working arrangements of a number of the great lines of the Eastern and Northern States of America; and it is perhaps scarcely necessary for us to urge, that observations conducted there under the eyes of an engineer of Mr. Passavant's previous experience in this country, may be turned to good account by all who are interested in the important details of construction of which he treats. The American locomotive is little known in this country, at least its details are but vaguely understood; probably Mr. Passavant, whom we shall now leave to conduct his own case, will be successful in his endeavors to add to our stock of information upon it.]

In the course of the pages, which are here to be devoted to the elucidation of this important branch of American engineering, many reasons will appear for a frequent expression of a favorable opinion upon the loco-

* From the Glasgow Practical Mechanic's Journal, for January, 1850.

motives of the country, chiefly, however, in reference to the principles upon which they are constructed. In an enumeration of the many engine-builders here, there are several to be found that turn out but rough-looking work. Often, where engines have to be rebuilt at the railroad companies' workshops, more care and better workmanship are there bestowed upon them than in the shops of the original builders; but generally they lack that beautiful glossy finish, and general elegance of design, which distinguish the English locomotives above all others. The engines from some of the larger workshops form splendid exceptions to this statement.

In thus judging, however, from outward look, we must not forget those circumstances which, on railroads here, dictate economy more severely than in England, and that the materials and, above all, labor are very dear. And generally, rough as some of the engines may appear at first sight, it is to be remembered that they are made for hard, rough usage and heavy work, whilst certain leading and excellent principles of construction are found in all, some of which it would be well to adopt in the English workshops. In explanation of these principles, illustrations will be taken from existing engines; and although there may be among these examples some that are not peculiarly commendable—for instance, among the various constructions of frames—there will be one showing the principle which guided the design, although the manner of carrying it out might, with advantage, have been widely different.

Two engines running on different lines, by different makers, I shall introduce with plans of their construction, and compare them with engines of similar power on English roads, as being very good specimens of perhaps—at least so far as I have seen—the best American locomotives. One of them is certainly the most steady-going engine I have ever been on, either here or in Europe. One is a goods engine, on a broad gauge—6 feet—line, with inside cylinders; the other is a narrow gauge engine, with outside connexions. Both these, and examples of other engines, are such as I have gathered myself, and the working of which I have personally observed.

The general construction of an engine is naturally modified by the circumstances under which it is to be used. The usual English passenger engine, with its driving-wheels underneath the centre of gravity, or nearly so, can be employed with considerable profit only on a line nearly level. In ascending gradients, though but slight and of short length, the power which the engine has to exert, and for which it must be constructed, bears a most unreasonable proportion to that necessary for the propulsion of the same train on more favorable sections. In no country has the principle of making the railroad as nearly level and straight as, without most inordinate expenditure, was possible, been carried to the same extreme as in England. The engine is of the kind which works with advantage on a level road; the road was constructed to suit the engine.

This has led to enormous sums of money being laid out on levelling hills, on forming tunnels, on deep cuttings, and high and long viaducts. Still gradients and curves cannot always be avoided. Heavy and powerful engines were built, the same principle being adhered to, with the main weight resting on one pair of drivers placed in the centre, the tractive power being obtained by one pair of wheels only. As the engines in-

creased in weight, rails and substructure had to be increased in strength; but the proportion between the weight of engine, or dead weight, and the weight of train, or paying weight, decreased. Where the gradient does not allow of the usual average velocity—where the engine has to climb up with difficulty, and slowly, even in fair weather—how much more in wet, rain, snow, and fog—it must afterwards run at a fearful rate, for which the builders scarcely designed her, to make up for lost time, to the injury of the machinery, the carriages, and the permanent way.

On the continent of Europe economy was more considered in the construction of railways; and gradients and curves have been employed, on many lines, more severe than those in England. The same style of engine, however, is employed, but the speed, generally, is slower.

In America economy and rapidity of construction were of still greater importance. The face of the country is, perhaps, not more unfavorable than in England; but the distances between populous towns is greater, and the roads have often to pass through large tracts of land which are but thinly peopled; therefore, whatever traffic might be created by increased facilities of communication, the same amount of traffic per mile, or per 100 miles, could not, in the first instance, be calculated on, as in England. The lines are laid along the natural undulations of the country; and, where practicable, large and expensive works are avoided. Thus we see lines passing through valleys, and following all the windings of large rivers, as the Hudson River Road, along the Hudson—the New York and Erie Road, along the Delaware and Susquehanna, and many others; going round hills rather than right through by tunnels, where this would entail more expense. The consequences are, heavy grades and sharp curves.

Such engines as were originally imported from England, adapted to the English lines—which, in the infancy of railway engineering, were made more easy than within the last seven or eight years—failed on the American lines; or better, the duty they performed, that is, the profitable paying duty, bore no just proportion to their absolute power. It was soon perceived, that to import or implicitly copy English engines would be ruinous to the pecuniary interests of the roads, except the English style of building the roads were also adopted.

The ever active, designing, and inventive spirit of the Americans was roused to build an engine to suit their roads. Experiments were made, and gradually certain principles were developed, which are now universally adopted, and enable the engines to go over arduous heavy lines with a speed equal to that used in England, and with equally heavy trains. Some of these principles would add considerably to the durability and effective power of an English engine; but the latter, as it now is made, would be of very little use on roads in this country.

The American engine I mention in the first paper, was one built by Norris of Philadelphia, about six or seven years ago, and is of a class then much used here—small and light; a truck with four small wheels in front, one pair of $4\frac{1}{2}$ feet driving-wheels in front of the fire-box, and outside cylinders. The peculiar style of American roads demands as light an engine as it is possible to make with a given power. Since that time, however, the system has been very much changed; eight-wheeled engines are very

general, and even many ten-wheeled are used. Of both classes I shall give illustrations.

Before leaving these general remarks, I will state, *en passant*, one particular which, in comparing the work done by an English and American engine, should be taken notice of. To determine the effect of the resistance of the atmosphere in retarding the speed or absorbing the power of an engine, many experiments have lately been made. One thing is certain, that extent of surface exposed against the current determines, at equal speeds, the amount of pressure. Here the American engines labor under a manifest disadvantage. Wood being the fuel used, they are obliged to carry a high, large, top-heavy chimney, with a cumbrous spark-catcher, very different from the small, slight chimney of an English engine. It acts against the engine, not only by its size, but also by the great leverage the heaviest part—the top—has from the centre line of the whole machine.

THE FRAME—AN INQUIRY INTO THE PRINCIPLES OF ITS STABILITY.

I premise here, that when I use the term “frame,” I allude to the frame-beam, bar, or plate, on one side only; and when speaking of the two sides together, with their transverse connexions, as *one* structure, I shall use the term “framing.”

The first great alteration, and attempt to depart in any important point from the English construction, was made in altering one of Stephenson’s engines, in 1833, I believe, by substituting for the leading axle the truck-frame, still almost universally used: that is, two axles were placed close together in one frame, separate and independent from the engine. This truck bears the front part of the engine, supporting its frame, and is movable round a pin, under the centre of the smoke-box. On passing through a curve, the wheels adjust themselves to it; and the great strain and friction of the flanches against the rails, and of the axles in their bearings, is thus relieved. If the centre driving-wheels, as generally is the case, have no flanches on their tyre, there is, in a curve, but little friction against the side of the rail, and none that can exercise an injurious effect on the machinery; besides, the danger of getting out of the track in switches, &c., is entirely avoided. With the introduction of this truck, the engine was at once enabled to pass, with perfect ease and safety, and at its highest speed, through curves on the main track, such as, in Europe, would be considered hardly safe even in sidings at stations.

The next alteration of great importance was the substitution of a straight axle for the cranked axle, placing the cylinders outside the frame, letting the axles run in inside bearings. This, with the truck, completely changed the character of the locomotive.

The same genius which thus altered, perceived the necessity for a framing more rigid than the usual one, and an entirely new construction was introduced, possessing great lateral stiffness.

Why was this necessary? On outside cylinder engines being built in England, instead of a stronger, a much weaker framing was used. There, engines with inside cylinders have always been constructed with two frames on each side; one only carries, but the second one contributes greatly to the lateral stiffness of the whole. That it is not necessary, is proved by

many such engines being constructed and successfully worked in this country, with only one frame, with inside bearings. On the cylinders being placed outside, the engines were found to oscillate much more. To resist or prevent this oscillation, the only way was to stiffen the engine laterally. This was the object of the new American frame. What was done in England to oppose this injurious tendency?

It is not, perhaps, out of place here to explain, not what the oscillation of an engine is—that is well known—but what circumstances cause and produce it; for if that had been well understood, the slight plate frame would not have been generally introduced for this class of engine.

The framing consists of two beams; or rather, it is a structure which has not only to carry a weight in a vertical direction, but is at the same time acted upon by forces against its sides in a lateral direction. In constructing it, we must take into account, and admit into the calculation, the whole duty it has to perform, and so proportion its strength. We must inquire into all the forces which act against it in various directions, and seek to disturb its equilibrium; the same as we should in constructing any bridge-girder or roof-truss. To carry vertically, it must possess depth according to the amount of superincumbent weight. To oppose lateral forces it must have breadth: that is, depth in the direction of the forces, to give it stiffness or rigidity.

What are these lateral forces? The rails cannot be laid in, or made to preserve, a straight even line along their sides, therefore the wheels may not be made to fit in tight between the rails. Whatever speed, consequently, the engine may go at in a straight line, but much more so in a curve, the front wheels, and hence the whole engine, will be forced over from one side of the track to the other. Reference is made in page 117, Vol. II. of this Journal, to the lateral pressure which the rails, from this cause, have to sustain. Where a pressure is sustained, there must be power to produce it; and where a power meets with resistance, a reaction is produced. This reaction on the part of the rails is experienced by the engine, which, by it, is made to roll over on the other side of the track; thence it rebounds, and thus—lateral play being always left in the bearings, to prevent the straining of the axles in curves—the bearings, and, from them, the frame, receives a succession of small shocks. These act upon the frame-plate with a leverage equal to the distance from the point of application—the wheel-centre—to the line of the centre of gravity, or, better, the neutral axis of the frame. Small as the shocks are at first, a new shock, or application of the force, being added before the effect of the former has ceased, they gradually produce, by their great leverage, a trembling or vibration of the frame-plate; which, if it be not laterally rigid enough to oppose the force, constantly increases. If we consider,—1st, that this trembling gradually spreads throughout the whole frame; 2d, where weight hangs, on its partaking of the motion, the momentum of the force is considerably increased; 3d, where there is no stiff connexion with the other side of the engine, giving great depth or support to the beam laterally, the motion is the greatest; 4th, in the English outside cylinder engine, the great weight of the cylinder and steam chests overhangs the point of vertical support, and has only a very trifling transverse stiffening; and 5th, at the leading axle the shocks are first received, and first imparted to the

frame, where the transverse connexion is far less rigid than at the back part of the engine,—we shall not be surprised to hear of such engines being exposed to very great oscillation; to more wear and tear, and resistance from strains; to greater injury of the permanent way—for the less the means of resisting the oscillation, the more will be its amount, and therefore the pressures against the sides of the rails increases; and, at very high speeds, on entering or leaving a curve, even to the danger of fairly swinging off the track.

The rolling motion of the engine cannot be avoided; but the tremulous one, the primary cause of such evil consequences, may, by judicious construction, be most successfully resisted. If we suppose a solid plate fixed in between the two frames, extending from this point to the fire-box, or, instead of that, the two trussed together like a bridge-truss, the motion imparted to any one point of the frame would be equally distributed throughout the whole structure, and the distance between the two would be the depth of the beam, resisting lateral pressure. Such a construction would, however, not only be very inconvenient, but it would produce a strength infinitely greater than is necessary. We will examine, therefore, whether there is not a way of attaining the requisite rigidity of frame without such trussing.

On comparison, we shall find some points of material difference in the constructions of the English and American framing.

For the sake of comparison, I shall take two engines, an English and an American one, both only lately constructed, and which may be considered very good examples of their respective classes. Both are outside cylinder engines, on narrow gauge lines; one is the outside cylinder engine, by Messrs. Sharp, Brothers & Co., (1848) of Manchester; (several engines have before been constructed by the same firm, very similar in general design, but without the tank;) and the other is the "Mohawk," outside cylinder, passenger and freight engine, on the Albany and Schenectady Railroad, N. Y., as rebuilt at the company's workshop in Albany, according to the designs, and under the superintendence, of their able engineer, Mr. McQueen, (now of the Hudson River Railroad,) and is an exceedingly powerful and steady engine. These two are tolerably well matched for comparison. No. 1—the English Engine—has 15-inch cylinders, and 20-inch stroke; No. 2 has 15-inch cylinders, and 25-inch stroke. One has $5\frac{1}{2}$ -foot drivers, the other 5-feet; both boilers are 3 feet 6 inches diameter, the English tubes being 10 feet $7\frac{3}{4}$ inches long; those of No. 2, 11 feet 10 inches. A sketch of these two engines, as placed in comparison, is appended to this article,* to which the reader is here referred; from this another advantage of No. 2 will be noticed, viz., the centre of its boiler is 4 feet $11\frac{1}{2}$ inches; in No. 2, 5 feet 7 inches above the rails, being—making allowance for the extra size of driving-wheels— $3\frac{1}{2}$ inches in favor of the former.

In engine No. 1—the English engine—the two frame-plates carry the whole weight; and, always taking the centre of gravity as the point where a force or weight is applied, the cylinders, steam-chests, smoke-box, and chimney, overhang the point of support by upwards of 3 feet. In No. 2, the frame-plates are, in front, themselves carried by the truck-frame, the

* And will appear in our next number.

vertical strain upon them being therefore less; and this support is placed underneath, or very near, the centre of the cylinders. Overhanging weight there is none, excepting the buffer-plank, with its appendages, which are certainly heavier than in No. 1; but their leverage distance from the point of support is smaller, and they are carried by a strong stay-rod. This tendency to oscillation is, therefore, removed. We find, moreover, in No. 1, a rigid leading axle, unavoidably subject to straining in curves, and one cause of oscillation. In No. 2, we find the truck movable round a centre pin, the wheels and axles easily adjusting themselves to the curvature—thus removing a great cause of wear and tear, and loss of power. The buffer-plank of No. 2, which acts as a transverse stay between the two frames, or a support to each against a lateral force, is placed much nearer the cylinders than in No. 1: that is, where, from the suspended weight, the momentum acquired by the vibration is greatest. We find, further, at this very spot, a very strong—both laterally and vertically—cast iron plate fixed in between the two frames, to which the cylinders are attached, a rigid connexion entirely wanting in No. 1, although this is the part where it is most needed. The manner of fixing the cylinders to this plate in No. 2 is undoubtedly firmer than the attachment in No. 1 to the frames; in the former case the bearing surface being broad, and in the latter only one row of bolts are used. Also, the straight plate of wrought iron passing under the boiler-barrel in No. 2, fixed to the frames, and carrying the slide-bars, is a more rigid stiffening, transversely, than the curved plate, which is at the same time a carrier to the boiler in No. 1. Were the form of the frame-beam the same with the above points of difference, we should rightly suppose No. 2 a more steady-going engine. But in the construction of these beams itself, we find a better proportioning of material, to the purpose for which it is designed, in No. 2. Each plate of No. 1, supported as it is, will bear near 100 tons vertically, without injury, if equally distributed along its length, and in a state of rest; but when we consider its lateral rigidity, its power of resistance to a force acting against its sides, the beam is of a length equal to the distance between the fire-box—where the transverse connexion is firmest—to the front buffer-plank, 13 ft. 5 in.

broad, 8 in. deep = $\frac{7}{8}$; and its strength to resist = $\frac{(\frac{7}{8})^2 \times 8 \times 5500}{13.4} = 2514$ lbs.;

or, considering the boiler-stay a sufficiently stiff connexion, the length of beam is reduced to 8.3, and its strength increased to $\frac{(\frac{7}{8})^2 \times 8 \times 5500}{8.3} = 4044.1$

lbs. The American frame consists of a bar of iron, 2 inches thick \times 4 inches broad. The distance from the fire-box to the cast iron plate is 11 feet 5 inches; the strength (laterally) of this beam is $\frac{4^2 \times 2 \times 5500}{11.416} = 6.8$ tons;

and, taking into consideration the cross-stay in the centre, the length of beam is only one-half, its rigidity double. In No. 1, a force equal to 2000 lbs., applied at the centre of this beam, is sufficient to bend it; in No. 2, 4 tons = 8800 lbs. is necessary.* The surplus strength of the English

* Moreover, the force being applied at the centre of the front wheels, it is in No. 1 applied near the centre of the beam; and in the second half is repeated by the driving-wheels having flanges. In No. 2 the power is applied at the end of the beam in the truck; and the driving-wheels have no flanges.

engine in no way contributes to increase the lateral stiffness of the structure; in the American engine it does altogether. The boiler, from its high position, exerts a lateral pressure against the frame; this diminishes the power of every frame to resist an external force. In many English outside cylinder engines there is not even the transverse plate, as in the one here cited; the boiler is carried by stays attached on each side, without such a connexion between them; and the builders trust that the boiler itself will form this connexion. But the very position of the boiler, as soon as the vibration is imparted to it, exposes it to even greater oscillation than the lower part of the engine; instead of steadying the frame, it will increase the momentum of its motion. Engineers will agree with me, that the stability of a structure should not be made to depend on the weight it has to carry; the structure must be strong, if it cannot itself resist all the external forces, in whatever direction they act against it. If that is the case, it alone can be trusted to keep steady a superincumbent weight. Who would trust the strength of a bridge, truss, or arch, where the weight of a train passing over it was necessary to bring all the posts home to their bearings?

Which of these two frames is the most scientific, and at the same time the most practical? Of two engines of equal power, which will produce the greatest useful effect? The one that works most easy, and has least oscillation and strain. Which will have the greater durability, and, therefore, be the more economical? The one which possesses greater steadiness of motion. This engine also works most easy; and it will be the one of most stability—the one best proportioned to meet the forces whose resistance it is opposed to. I leave it to my readers to judge between the two classes of framing.

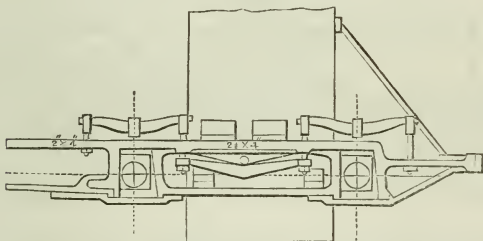
Generally, the inside cylinder engine is far more steady; but the real cause of this superior steadiness seems not to have been rightly investigated, otherwise it would have been so easy to furnish the other class with that principle of construction which was wanting to make it steady. Comparing the two classes of English engines, we are not surprised at the greater stability of the one; but we may be surprised that, the greater oscillation being acknowledged, a construction so bad in theory, and proved by experience so insufficient, should have been retained. Not only does the inner frame of an engine with inside connexions—which, however, in many cases, is not used in America—contribute to and more than double the stiffness of the structure laterally, but the position of the cylinders, and their attachment with one another and with the frame, contribute to it, and, with the cross-plate carrying the slide bars, divide the bearing length of the beam—taking it as above to resist a lateral pressure—into three parts, and increase its rigidity ninefold.

Treating on the stability of the framing, we meet with another principle in the American construction, intimately bearing upon the same subject. It is the same principle which is recognised and acted on in accordance with, in all solid constructions, in all straight and curved girders, and in arches, namely, that all external forces acting on it, tending to destroy its equilibrium, should meet in the line of resistance of such structure, and that this line of resistance should lie within it.

The direction in which the propelling power of an engine acts, is in a

line with the centre of the driving-wheel. This power is transferred through the frame to the couplings and the train. If a line through the centre of the buffers and couplings lie in a level with the line of resistance and centre of driving-wheel, then the pull and resistance being all in the same level, there will be no power lost, nor will straining in the frame be produced through the injurious leverage which the resistance has upon the power, viz., the distance from the level, where the power has to be applied, to where it is exerted, *i. e.* from the line of resistance to the centre of the wheel. BOTH SHOULD FALL WITHIN THE FRAME-BEAM. The height of the couplings always remains the same; but the size of the driving-wheel, and, therefore, the position of its centre, varies very much. In some engines with the plate-frame and large driving-wheels, the plate is so shaped that this object is attained; let us compare, for instance, the two engines of the Great Western Railway, shown in Tredgold. In the "Iron Duke," the centre of the driving-wheel very nearly coincides with the top line of the main frame; while, in the "Pyracmon," the centre lies 9 inches below the lower edge of the frame. The line of resistance being, in both cases, in the centre of the plate, the power, in one case, is much nearer where it is required, and acts, therefore, with greater advantage than in the latter.

Fig. 1.



From this reason, the horn-plates, within which the axle-box rests, are exposed to a great strain, and, when the engine pulls a very heavy train, might be liable to yield. Therefore, the very strong construction of frame was adopted in engines of the Pyracmon class, having, however, the disadvantage of unnecessary weight and waste of material. The general construction of horn-plates—whether cut out of the same sheet with the frame, or riveted on—with the stay-rods between them, to oppose this yielding, is well known.

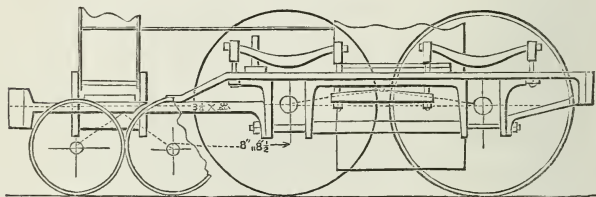
In the examples of American locomotive frames added above, the lower bar, instead of a mere stiffening stay, is as important to the bearing power of the whole as the upper one; in fact, the frame is constructed like a trussed beam, the centre line of which coincides with the centre of the driving-wheel; the back half of the frame, having a great weight to carry, is thus made of great strength; the front half is much weaker, because its true strength, transversely, is not called into action to the same amount.

Of the three examples here given, figs. 1 and 2 are for coupled engines. Fig. 1 shows a frame remarkably strong in all directions; it belongs to an

engine of the class of the "Mohawk," and is designed by the same engineer; it is only partly shown, the part left out, being the same as in the "Mohawk," will be seen in that drawing. Fig. 2 is the frame of an engine by the Springfield Car and Engine Co., and serves to show in what way the principles of construction, detailed above, are carried out by other makers. Fig. 3* is a frame lately constructed on an engine with only one pair of drivers. Much as it varies from the other constructions, it embodies their sound principles, combined with great firmness and rigidity. At first sight, it may appear as if this frame were not a strong or good one, because it consists of two pieces; but the real centre of support is not over the axle, but at the point of suspension of the springs, and over the wheel-centre; it is not the relative strength, that is, the power to resist transverse strain, but the absolute strength, or direct cohesion of the metal, which is called into action. This frame was constructed by the Matteawan Machine Building Company.

A peculiar combination of the springs for the hind wheels will be observed in all these examples. A compensation lever is placed between the two springs, on which rests the weight; the centre of the lever being halfway between the two axles, and to its ends the springs are attached.

Fig. 2.



This arrangement balances the engine beautifully. The pumping motion, its causes and consequences, have been fully described before, and it causes the weight resting on the driving-wheels, and consequently the tractive power, to be subject to constant variation. When, by inequalities in the surface of the road, one pair of wheels would be relieved of part of the weight—which of course would, in the English construction, be thrown on the others—then this lever comes into play, and equalizes the weight between them, so that, whatever position the wheels be in, they have always the same weight resting upon them, and can always exert the same amount of tractive power.

This plan is obviously to be preferred to the construction in an English coupled engine; where, on less weight resting on one pair of wheels by their descending into a hollow on the surface of the rail, a larger proportion of weight is thrown on the other pair; what one pair loses in tractive power, the other has to exert more. A similar object is attained in the 8-wheeled engines on the Great Western Road, and in that of Mr. Cramp-ton on the fore-wheels only; where, they not being drivers, it is of less

* This figure will also be given next month.

consequence in the steadying of the engine, by two wheels having only one spring. But compare the weight and expense of one spring of 6 or 7 and 8 feet long, to two common springs with the compensation lever.

This construction also adds materially to the steadiness of the engine. In English locomotives, each wheel having a separate spring, that part of the shock or jerk, which is not taken up by the spring, is imparted to the frame; by the use of the compensation lever, the two springs are affected at the same time, and to the frame is imparted only a very small part of the force, which it receives entire where no such contrivance is used. The same object, of dividing the shock upon two wheels, and thus producing a smaller effect on the body of the engine, is obtained by the use of the truck-frame. The whole engine is balanced upon two centres, in such a way that, however the wheels may stand, it is but little affected by the irregularity of their position, and, as near as it is possible, always retains an exact horizontal or level position.

In fig. 1, a stay will be noticed from the back of the fire-box to the frame; another is placed—as seen in the drawing of the “Mohawk”—from the smoke-box to the frame. These stays are used in most American engines, and serve to strengthen, stiffen, and, as it were, truss the whole structure. They not only steady the smoke-box, but tend to throw what little overhang weight there is more effectually on the wheels. Another advantage of the American frame, is the saving of expense in material and labor of construction. These are the great principles by which American engineers have successfully attempted to give steadiness, stability, and durability to their engines.

I have dwelt long upon the construction of the frame, but I hope not longer than the subject deserves; the above three qualities of a locomotive, or the three virtues, are solely dependent upon a sound, well-constructed frame. A building may be ever so well and strongly built, if its foundation is bad it will fall. The same holds good in all structures, and why not in a locomotive?

New York, November, 1849.

(To be Continued.)

*Revenue of British Railways.**

The revenue of British railways, observes a contemporary, cannot now be put down at less than twelve millions a year—a greater sum than many important political States possess. Two hundred millions of money were expended upon them up to the close of last year, and even in the midst of the deep depression of 1848, when commerce was, as it were, in a state of complete collapse, not less than £33,234,818 were expended in railway works. The number of passengers on these “new highways” during the last six months of 1848 was no less than 31,630,292, expending a sum of £3,283,301; or at the rate of 63,260,584, expending £6,566,602 for the year. In the same half-year, goods, cattle, and parcels were conveyed at the charge of £2,461,662, or £4,923,324 in the year. The amount of

* From the London Builder, No. 347.

traffic for the week before last (Sept. 22) on 4941 miles of railway was £245,550, being an increase of £19,815 over the corresponding week of last year, when the mileage was 4091. The average earnings per mile were £50, while last year they were £55.

*Breaking of Railway Bridges.**

In August, 1847, a Royal Commission was appointed "for the purpose of inquiring into the condition to be observed by engineers in the application of iron in structures exposed to violent concussions and vibration." Among other branches of inquiry, the members of the Commission have lately been making experiments on the motion of a carriage, variously loaded in different experiments, which passed with different velocities over a slight iron bridge; the object of the experiments being to examine the effect of the velocity of a train in increasing or decreasing the tendency of a bridge, over which the train is passing, to break under its weight. The remarkable result was obtained, that the deflexion is, in some cases, much greater than the central statical deflexion, and that the greatest deflexion takes place after the body has passed the centre of the bridge.

Dividends on Railway Stocks.†

The dividends declared on ten of the principal lines of railway in England and Scotland, for the first half-year of 1849, have been as follows:

1	at	£7	per cent.	per annum.
3	at	4	"	"
1	at	3 5s.	"	"
2	at	3	"	"
1	at	2 18s.	"	"
1	at	2 2s.	"	"
1	at	1	"	"

Two others have earned $1\frac{1}{8}$ and $3\frac{1}{2}$ per cent. per annum, but as yet no dividend has been declared upon them.

India Rubber Buffers and Springs.‡

India rubber buffers and springs have now been introduced, it is said, on upwards of fifty lines of railway, and stood the test of heat and cold, and wear and tear, so as to form a cheap and useful substitute for the old apparatus. Needing no cumbrous extension beneath the wagon or carriage framing, they can be fitted to newly-built wagons, it is alleged, for about £4 10s. a set, and the wear and tear of the old buffers, estimated on luggage trains at 50 to 60 per cent. on their own much greater cost, thus reduced to 10 per cent. The material has also been tried for bearing springs, but has not hitherto come into use as such.

* From the London, Edinburgh, and Dublin Philosophical Magazine, for September, 1849.

† From the London Railway Magazine, No. 538.

‡ From the London Builder, No. 347.

AMERICAN PATENTS.

To our Subscribers.

[When the Franklin Institute first began to publish the claims of the Patents, they resolved to keep their record six months behind the current date, in order not to interfere with the right of the inventors to take out a Patent in other countries. At present, however, since the record of Patents is published in other periodicals up to their date, this precaution has become useless; and the Committee of Publication have determined to bring up their record of Patents also to the date of issue. In doing this, owing to the great number of Patents issued since the appointment of additional examiners, it has been found necessary to insert the Patent List in smaller type than has been heretofore used. Great pains have, however, been taken in its selection, and it is hoped that, while our subscribers gain in quantity of reading matter, and in the greater novelty of the List, they will lose nothing on the part of distinctness of type and legibility.—ED.]

List of American Patents which issued in July, 1849, with Exemplifications by CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

Continued from page 120.

34. For an *Improvement in Pump Valves and their Arrangement*; Thos. Thatcher, Wilkesbarre, Luzerne county, Pennsylvania, July 17.

The patentee says,—“The nature of my invention consists, 1st, in connecting together the valves of the cylinders of two alternating single acting pumps, or the valves of the upper and lower portions of the cylinder of a double acting pump, in such manner that the two injection valves cannot both be open to their full extent at the same moment; the two discharge valves being connected in like manner.

“2d, In giving the wings of valves a spiral or screw form, whereby the motion of the water through the valve causes it to rotate on its axis.”

Claim.—“What I claim as my invention, is connecting the valves, substantially in the manner and for the purpose herein set forth.

“I also claim making the wings of valves of a spiral or screw form, substantially in the manner and for the purpose herein set forth.”

35. For an *Improvement in Winnowing Machines*; Abraham Straub, Milton, Northumberland county, Pennsylvania, July 17.

The patentee says,—“My invention consists in the combination of a wind chest and register, by which the grain to be cleansed is exposed to a uniform current of air, the amount of which may be regulated at pleasure.”

Claim.—“What I claim as my invention, is the combination of a wind chest and adjustable register with a separating box, substantially in the manner and for the purpose herein set forth.”

36. For an *Improvement in Smut Machines*; Albert Buel and Thomas Brown, Lowville, Lewis county, New York, July 17.

Claim.—“What we claim as our invention, is, 1st, the combination of the beaters, ribs, and teeth, with the circular disk, constructed, arranged, and operating in the manner and for the purpose set forth.

“We also claim the combination of the perforated or reticulated curbs, let into and surrounding the central air holes of the top and bottom of the stationary cylinder, in combination with said stationary cylinder, made in the manner described; said reticulated curbs operating in the manner set forth, by which free currents of air are produced through the central openings of the top and bottom of the cylinder to the centre thereof, and thence radially from the cylinder through its sides, carrying off the smut immediately on its being separated from the grain, and before the smut can have time to descend and again become mixed with it as described.”

37. For an *Improvement in Vegetable Cutters*; Wyllys Avery, Salisbury, Herkimer county, New York, July 17.

The patentee says,—“My improvement consists in causing the hopper in which the vegetables are put to revolve around the knives, which are stationary, and furnishing said hopper with inclined curved partitions or arms, which serve to hold the vegetables in contact with the knives while cutting.”

Claim.—“What I claim as new, is constructing the hopper in the manner set forth, by means of the combination of inclined arms and spreading sides, in the manner and for the purpose set forth, and combining it with, and revolving it over, a series of stationary knives, as set forth.”

38. For an *Improved Deflector for Spark Arresters*; Samuel Swett, City of New York, July 24.

The patentee says,—“The principal improvement that I have made, is placing a hollow trumpet-shaped button and curved or inverted conical cap directly over the centre of the smoke pipe, and under the central opening in the dome, forming a steam way, for the purpose of receiving a portion of the escape steam, and causing it to issue in a circular stream at the periphery of the largest end of the said trumpet-shaped hollow button, by a curved cap plate placed over the large end of the trumpet-shaped button; the steam being made to issue downward in a circular sheet, and to pass obliquely through the column of smoke and sparks as it passes over the edges of the trumpet-shaped button and cap; the steam striking the sparks and driving them against the concave surface of the dome, and extinguishing the sparks and turning them downward into the space between the smoke pipe and surrounding jacket, whilst a portion of the smoke will pass with the draft through the eye of the dome, and a portion will pass through the meshes of the wire gauze.”

Claim.—“What I claim as my invention, is the combination of the stationary hollow trumpet-shaped pendent button and stationary curved cap with the dome, constructed, arranged, and operating in the manner and for the purpose set forth; by which I am enabled to prevent the escape of the sparks with the smoke; the effect of the steam from the exhaust pipes entering the hollow button being three-fold: first, to force the sparks downward by coming in contact with them at the circular passage; secondly, to extinguish them, and thirdly, to increase their specific gravity, and thus cause them to fall immediately to the bottom of the cinder box.”

39. For an *Improved Whistle-Tree Hook*; A. N. Gray, Cleveland, Cuyahoga county, Ohio, July 24.

The patentee says,—“The object of this improvement is to prevent the danger of the escape of the cock-eye, or tug, from the hooked ends of the whistle-tree.”

Claim.—“What I claim as my invention, is the manner set forth of combining the hook with the ferule, so as to admit the former to turn round in the latter, when the cock-eye, or tug, is to be inserted or removed; the respective stops, and the auxiliary hook, being arranged substantially in the manner set forth, so as to prevent the accidental escape of the tug from the hook.”

40. For an *Improvement in Calculating Machines*; Samuel S. Young, Eaton, Preble county, Ohio, July 24.

Claim.—“What I claim as my invention, is the combination of the slides with the indices and the bars, in the manner and for the purposes set forth.”

41. For an *Improvement in Making Elevator Tubes for Lamp Wicks*; Cornelius & Co., assignees of Robt. Cornelius and Chas. Wilhelm, Philadelphia, Pennsylvania, July 24.

The patentees say,—“Our invention has for its primary object the formation of tubes requiring different thicknesses of metal in different parts of the tube, or to have a spiral groove traversing either the interior or the exterior of the tube.”

Claim.—“What we claim as our invention, is the manner of making the elevators of tubular lamp wicks, by combining a spiral, produced by coiling a band or ribbon of metal into a cylindrical figure, with another band of metal formed into a similar spiral, but so as to leave a spiral slot or opening between its contiguous edges, the one spiral being placed within the other, and the two breaking joints with each other, and united to form a tube, spirally grooved or screw-shaped either within or without, or both within and without at the same time, in the manner and for the purposes set forth.”

42. For an *Improvement in Casting Types*; John Batchelder, Boston, joint inventor with, and assignee of, Simon D. Dyer, Chelsea, Suffolk county, Massachusetts, July 24.

Claim.—"What we claim as our invention, is a combination of machinery made up of the following elements, or their mechanical equivalents, the same consisting of the endless chain and its wheels, the series of mould sections applied thereto, and having moulds made in them, essentially as described; one or more plates or walls, (having one or more air escape holes made through them,) and the vessel *u*, or other suitable substitute; all made to operate together substantially in the manner and for the purpose specified."

43. For an *Improvement in Seed Planters*; R. H. Springstead, Wooster, Wayne county, Ohio, July 24.

Claim.—"What I claim as my invention, is the making use of open inclined conductors, for conveying the grain or seeds from the grain box to the ground, when combined with the series of gates, and the movable adjustable side of the grain box, for regulating and governing the discharge of the seeds or grain therefrom, substantially as described.

"I also claim the manner of arranging and combining the series of reciprocating and vibrating stirrers with each other within the grain box, substantially in the manner and for the purpose set forth.

"I also claim the combination of the reciprocating and vibrating stirrers with the continuous discharging aperture in the grain box, and the regulating gates connected therewith, and with the series of inclined open seed or grain conductors, substantially in the manner set forth."

44. For an *Improvement in Hill-Side Ploughs*; Allen Eldred, Little Falls, Herkimer county, New York, July 24.

Claim.—"What I claim as new, is constructing a hill-side plough substantially in the manner described, by making the entire land-side stationary, and combining therewith two mould-boards revolving on a shaft above said land-side, so as to turn a furrow on either side when brought into position by means of a crank, or other analogous device, near the handles of the ploughs."

45. For an *Improvement in Sofa Bedsteads*; Edwin B. Bowditch, New Haven, Connecticut, July 24.

Claim.—"What I claim as my invention, is the construction of a seat or bed, placed under the ordinary seat of a sofa, couch, lounge, or any other suitable piece of furniture, which will revolve on suitable pins or pivots of wood or metal, at each end, working in slots, as described; said seat or bed to be hinged to the ordinary seat in such a manner that, when the ordinary seat is drawn or lifted forward, the under seat or bed will revolve, and come on a level with the ordinary seat, which, combined, will form a level and good sized bed."

46. For an *Improvement in Connecting Hubs with Axles*; Junius Foster, Bridgeport, Fairfield county, Connecticut, July 24.

The patentee says,—"The nature of my invention consists in fastening the hubs of carriage wheels on to their axles, by means of a spring catch which fits in a groove made in the inner end of the hub, the said catch being on the end of a spring attached to the top of the axle, and provided with a pin which passes through a hole in the axle, and extending to a sufficient distance below it to admit of forcing up the catch out of the groove in the hub, for the purpose of taking off the wheel."

Claim.—"What I claim as my invention, is securing the hub of a carriage wheel to its axle by means of a catch or segment collar, fitting in a groove of the hub or pipe-box, in combination with the spring connexion of the said segment collar, and the pin or other projection passing down below the axle, substantially as described, to admit of disconnecting the collar in lifting up the wheel, as described."

47. For an *Improvement in Apparatus for Unloading Carts, &c.*; Charles Downer, Philadelphia, Pennsylvania, July 24.

Claim.—"What I claim as my invention, is the combination of the upper or tilting frame with the lower frame, the latter being either stationary or on wheels. I furthermore claim the central lever, with its check and hook, in combination with the stanchion rod, the cam,

and the stanchions; and said lever, check and hook, stanchion rod, cam, and stanchions, in combination with the tilting frame, being mounted either on a stationary frame or on wheels; the construction, arrangement, and operation of all of which being substantially in the manner and for the purposes described."

48. For an *Improvement in Metallic Boot Heels*; G. S. Langdon, Rising Sun, Maryland, assignee of Patrick S. Devlan, Reading, Berks county, Pennsylvania, July 24.

The patentee says,—"My invention and improvement consists in making a hollow metallic heel for boots and shoes in two parts, one placed within the other, with a spring between them, to support the weight of the body, and prevent the unpleasant shocks produced by the concussion of the ordinary boot heel upon a hard surface when the wearer is walking fast."

Claim.—"What I claim as my invention, is making a metallic tread for the heels of shoes and boots, separate from, but secured within, the casing of the heel, in such a manner that it shall be free to change its position, to accommodate itself to the inequalities of the surface of the ground, whereby it wears more evenly, and is less fatiguing to the foot than a rigid heel, in the manner set forth."

49. For an *Improvement in Ploughs*; John Rich, Troy, New York, July 31.

The patentee says,—"My improvement consists in the mode of constructing the bed or nose-piece of a plough, for the securing of the mould-board thereto, and of the manner of securing the handles."

Claim.—"What I claim as my invention, is, 1st, the manner of forming the bed of a plough, with a socket for the admission of the handles, and securing the mould-board to the bed by means of the knob; the one wedge serving the double purpose of retaining the mould-board and lower ends of the handles in place, in the manner described.

"2d, I also claim the so constructing the brace as to make a firm rest and fastening for the handles, thereby rendering an effective and simple fastening for the handles of a plough; the whole being arranged substantially as set forth."

50. For *Improvements in Movable Breeches for Fire Arms, and the Locks and Appurtenances of the same*; Benjamin Chambers, City of Washington, D. C., July 31.

The patentee says,—"My improvements have reference as well to the construction as to the mode of using cannon, the object being to produce such an improvement in fire arms as will secure all the strength necessary, together with suitable weight of metal, and a prompt, safe, and easy mode of charging and discharging the piece."

Claim.—"What I claim as new, is forming the breech of a gun, and its breech-piece or pin, with sectional screws cut therein, for the purpose of speedily opening the breech for swabbing, depositing the load, and readily closing it again when the gun is to be discharged, as set forth.

"2d, I also claim, in combination with a sectional screw breech-piece, the hinged support, the slot, and lever, whereby the said breech-piece is easily moved into and out of place in closing and opening the gun, for the purposes set forth.

"3d, I also claim forming the gun-lock in such a manner that the hammer-rod, and percussion rod shall be in separate pieces, laying axially within the same barrel, whereby the coiled main spring is made to urge the hammer-rod against the head of the percussion-rod to discharge the piece, and the recoil spring on the percussion-rod is made immediately to draw back, and hold the valve which closes the interior of the lock against access of smoke and gases, as set forth.

"4th, I also claim, in combination with a gun having a dissected screw breech, the flanged shield through which the cartridge is made to pass into the chamber over the dissected screw, without danger of being broken by the ends and edges of the threads, as set forth.

"5th, I also claim the perforated point or nipple on the percussion cap, for penetrating the enclosing material of the cartridge, and insuring the discharge of the gunpowder when the percussion is given in the rear of the cartridge, in the manner herein set forth.

"6th, I also claim, in combination with a rammer for charging guns at the breech, the projecting central point, whereby the cartridge, in being driven to its place in the chamber, is perforated at its base to receive the point of the percussion cap herein described, for the purpose of insuring the ignition of the gunpowder, as set forth.

"7th, I also claim the enlargement near the shoulder of the rammer, whereby the shield, through which the cartridge has been rammed, is made to adhere by friction to the rammer, and to be drawn out of the breech of the gun without requiring a separate operation for taking it out."

51. For an *Improvement in Machines for Pegging Boots and Shoes*; James La Dow, Granville, Licking county, Ohio, July 31.

Claim.—"What I claim as my invention, is the manner described of simultaneously punching one or more holes in the leather, and driving pegs into others previously made, by means of the awls and punches, arranged as described, or in any substantially similar manner.

"2d, The manner of supplying the pegs to be driven by the punches, by conveying them from the hopper in a channel which turns them from a horizontal to a vertical position, with the points downwards, ready to be driven into the holes punctured in the leather for their reception.

"3d, The combination of the guide-point with the set-screw, for regulating the distance of the pegs from each other, and from the edge of the sole.

"4th, The manner of raising the holder by means of a thumb lever, whether arranged and operating as described, or in any other substantially similar manner.

"5th, The combination of the bent lever, connecting rod, and pushers, for the purpose of driving the pegs out of the hopper into the channels which convey them to the punch holes."

52. For an *Improvement in Equalizing the Action of Gearing in Horse Powers*; Charles Caples, Savannah, Andrew county, Missouri, July 31.

The patentee says,—"My invention consists in attaching the wheels to their spindles by flexible bars or springs, instead of the usual rigid methods of keys, plugs, or pins."

Claim.—"What I claim as my invention, is equalizing the strain, and lessening the force of shocks upon a train of cog-wheels, by connecting the wheels with their shafts by springs, substantially as set forth."

53. For an *Improvement in the Process of Hardening Metals*; Asa Wheeler, Warwick, Franklin county, Massachusetts, July 31.

Claim.—"What I claim, is hardening steel or iron by immersing it below the surface of, and in, water, and then causing one or more jets to play through the body of the water, and against the metal or part thereof to be hardened."

54. For an *Improvement in the Valves of Rotary Engines*; Jas. P. Ross, Lewisburg, Union county, Pennsylvania, July 31.

The patentee says,—"The nature of my invention consists in the mode of connecting the runner or piston with the annular chamber, the construction, adaptation, and mode of operation of the valve, and the connexion therewith of the cut-off when used."

Claim.—"What I claim as new, is the sliding valve, constructed as described, with an exhaust port therein, which is stopped by the piston while it is opening the valve, as set forth."

55. For an *Improvement in Signal Lanterns*; George Callard, Buffalo, New York, July 31.

The patentee says,—"My invention consists of a revolving cylinder, having a particular arrangement of colored and plain glass, by various combinations of which the different signals are made, and all positions in which a sailing vessel may be placed are indicated."

Claim.—"What I claim as my invention, is the revolving cylinder of colored and plain glass, arranged in a portable signal lantern, in the manner and for the purpose herein set forth."

56. For an *Improvement in Machines to Beat and Brush Carpets*; William Peters, Charlestown, Middlesex county, Massachusetts, July 31.

Claim.—"What I desire to claim as my invention, is the employment of dusters or beaters, as herein described, for dusting or cleansing carpets or other fabrics of the same sort, not wishing to limit myself to the exact method of employing the power."

57. For an *Improvement in Paring, Coring, and Slicing Apples*; Julius Weed, Painesville, Lake county, Ohio, July 31.

Claim.—"What I claim as my invention are the following particulars: 1st, The arrangement of a segment wheel attached to a shaft, said shaft having a socket with projecting arms, for the insertion of the knife handle; said segment wheel meshing into a bevel wheel formed on the driving wheel, which said bevel contains a bare space and wide cog, for the purposes

described; the said shaft having a swinging or vibrating weight attached thereto for the use above stated.

"2d, The arrangement of a sliding corer, for coring the apple, and for detaching it from the fork, and the guide for dropping the apple from the coring tube, as described.

"3d, A slicing apparatus, with cutters or slicers of tin or steel, of the form and arrangement as described, placed under the foundation, and connected with the driving wheel aforesaid, so as to perform the operation of slicing, at the same time with that of paring.

"4th, The arrangement of paring, coring, and slicing, combined in the same machine, as described. And I make no other claim."

58. For an *Improvement in Ploughs*; Jesse Warren, Glen's Falls, Warren county, New York, July 31.

The patentee says,—“The character of my invention and improvements in the plough consist in the construction and combination of the combined cutter and bed-point with the mould-board.

“Also, in constructing the mould-board in two pieces or sections, the upper half of which being movable and made adjustable by means of a hook-bar, to give more or less turn to the sward in ploughing; and also adapting the mould-board for various kinds of soil. And in combining with the plough, next its land-side, a sustaining and gauging wheel, for gauging the depth of the furrow and relieving the plough.


“Likewise in placing a horizontal adjustable leveller and weed cutter in front of the sustaining wheel, fixed to a shield projecting up in front and over the wheel, to protect it from accident. Also, the manner of attaching and securing the rear end of the mould-board permanently to the inside of the landside of the plough, by means of a trapezoidal-shaped connecting plate bolted to the land-side. And likewise the manner of securing the land bar to the land-side of the plough.”

Claim.—“What I claim as my invention, is, 1st, the exclusive use of a mould-board composed of two sections or parts, the lower section or part being secured to the land-side by the trapezoidal-shaped plate, and extension or bed upon which it rests, the upper section or part being adjustable and joined thereto by projecting pivots upon which it turns, and adjusted and secured by means of a hook-bar fixed to the land-side; the whole being constructed and arranged in the manner described.

“I also claim the manner of securing and attaching the land-bar to the land-side, as described.

“I likewise claim the combination of the adjustable weed cutter and leveller with the land-side and adjustable sustaining wheel, as described.”

59. For an *Improvement in Apparatus for Filtering Water, &c.*; Justin Mulhern, St. Louis, Missouri, July 31.

Claim.—“What I claim as my invention in my improved apparatus for purifying Mississippi river water, is the combination of the settling chambers and filtering compartments, substantially in the manner set forth, to wit: The first settling chamber, being the reservoir or head, extending under the first filtering compartment, and the remaining settling chambers being nearly in the form of an , with the vertical portion of each chamber, for the passage of water, situated between two filtering compartments, and sufficiently large to admit of easy access for cleansing, and its horizontal portion extending under one of the said filtering compartments: by which arrangement the water will filtrate upwardly from the reservoir, through the first filtering compartment, and flow thence into the vertical portion of the next settling chamber, in which it will descend into the horizontal portion of the same, and thence will ascend through the second filtering compartment, and thus continue its course through the entire series of settling chambers and filtering compartments till it reaches the pure water reservoir at the opposite end of the apparatus; by which combination and arrangement free access can be had to the settling chambers and filtering compartments, for the purpose of cleansing them, substantially as herein set forth. Not intending, by the above claim, to cover the general principle of the combination of a series of settling chambers with upwardly filtering compartments; the gist of my invention consisting in such an arrangement and combination of settling chambers and filtering compartments as will give free access to both of them, for the purpose of cleansing them of foul deposits, substantially as herein set forth.”

60. For an *Improvement in Bee Hives*; Joseph A. Dugdale, Selma, Clark county, Ohio, July 31.

Claim.—“What I claim, 1st, is a sash door with a woven wire screen, in combination with

projecting parts of the hive, so constructed as to form a recess or space in front of the hive, of sufficient size to accommodate a cluster of bees according to their habits of hanging outside the hive; and so that they may be enclosed and protected whether outside or inside of the hive, by closing the door at night, from the moths, as specified."

RE-ISSUE FOR JULY, 1849.

1. For an *Improvement in the Machine for Cleaning Wool from Burs and other foreign matter, and also for Ginning Cotton*; Milton D. Whipple, Lowell, Middlesex county, Massachusetts; patented October 28, 1840, re-issued July 31.

Claim.—"I claim, 1st, the machine as a whole, consisting in general of the constituent parts in combination, as described, and that, though equivalents may be substituted for some of these parts, for like purposes and substantially the same, viz., the combination of the common feeding and picking apparatus with the comb-toothed cylinder.

"2d, I claim forming and arranging the teeth of cylinders for burring wool and cleaning cotton, and other fibrous substances, in such a manner that their outer convex sides shall be substantially concentric with the axis of the cylinder, for the purpose of seizing and holding the fibres, and presenting a surface against which the guard can act in removing burs and other foreign matter therefrom."

DESIGNS FOR JULY, 1849.

1. For a *Design for Stoves*; North, Harrison & Co., Philadelphia, Pennsylvania, assignees of Samuel W. Gibbs, Albany, New York, July 10.
2. For a *Design for Cooking Stoves*; A. C. Barstow, Providence, Rhode Island, July 10.
3. For a *Design for Stoves*; Samuel Hill and Stephen B. Cline, Philadelphia, Pennsylvania, July 17.

The claim to each of the above patents is for the designs as represented in the specifications.

List of American Patents which issued in August, 1849, with Exemplifications by CHARLES M. KELLER, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in Salting Meats*; Thomas Davison, City of New York, August 7.

The patentee says,—"The nature of my invention consists in communicating motion to meat while undergoing the process of salting or curing, causing the brine, or other substance with which it is desired to impregnate it, to circulate around all the pieces of meat, in order to supply the surface as rapidly as it is absorbed by the interior portions; and also, by keeping the particles of the meat in motion, effecting a rapid transfer of the salt from the particles on the outside to those adjoining, and so on till the whole piece is salted."

Claim.—"What I claim as new, is rotating or otherwise moving, as described, the flesh of animals, while in contact with salt or other substances with which it is desired to impregnate it, thereby accelerating or aiding their incorporation or mixing more readily than can be done by hand."

2. For an *Improvement in Gas Lamps*; Horatio G. Sickel, Philadelphia, Pennsylvania, August 7.

Claim.—"What I claim as my invention and improvement in lamps for producing light, by burning the vapor or gas generated within itself, in the manner of gas burners, is, 1st, the mode of regulating and extinguishing the light, when required, by means of a valve formed by the top of the inner cylinder, and the end or surface of the button attached to the head of the outer cylinder, whether the several parts forming said valve be made and arranged in the manner described, or other mode substantially the same, by which similar results shall be produced.

"2d, I also claim the employment of the safety valve, in combination with the guard-plate, constructed substantially as described.

"3d, I likewise claim the use of the guard, in combination with the combined burner and generator, arranged and operating in the manner and for the purpose set forth.

"4th, I also claim combining the generator, burner, ring, and guard, in a single piece, made to ascend and descend simultaneously in the manner and for the purpose substantially as set forth."

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3. For an *Improvement in Argand Burners for Gas Lamps*; John G. Webb, Williamsburg, Kings county, New York, August 7.

Claim.—"I claim the application of the conductor and button, acting in the centre of an Argand burner, to conduct heat to the liquid matter in the wick below, for the purpose of making the Argand burner a self-generator of the gas it consumes; substantially in the manner and with the effects described."

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4. For an *Improvement in Gas Apparatus*; Andrew Walker, Jr., Burke, Caledonia county, Vermont, August 7.

Claim.—"What I claim as my invention, is the mode of washing the gas, or evaporating the acid, the same consisting in the employment of a close horizontal vessel, and a current of water made to flow through it as specified, and passing the gas into one end of the vessel and water, and out at the other end thereof, all essentially as specified.

"I also claim the combination of a lime cistern or vessel with either the gas holder or purifier, in manner and for the purpose as above specified; not meaning to claim the use of lime for abstracting moisture, as the same is a well known absorbent."

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5. For an *Improvement in Blocks for Setting Hat Brims*; Sylvester Billings, Spring Garden, Philadelphia county, Pennsylvania, August 7.

The patentee says,—"The nature of my invention consists in providing a heater for softening the brim of a hat, in order that it may receive the proper curl and shape."

Claim.—"What I claim as my invention, is the combination of the convex surface and the iron or metallic weight, made concave to fit the convexity of the convex surface, as represented."

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6. For an *Improvement in Securing Hooks and Eyes to Tape and Dresses*; Charles Atwood, Derby, New Haven county, Connecticut, August 7.

The patentee says,—"The nature of my invention consists in bending and forming the shanks of hooks and eyes made of wire, and the attaching them to the tape by their shanks, in the manner described."

Claim.—"What I claim as my invention, is the oblong loop or eyelet, in combination with the hook and eye, so as to fasten them to garments by means of tape, and by me designated 'Tape Hook,' as described; and also the attaching of hooks and eyes to tape, as described, so as to form the article by me designated 'Hook Tape.'"

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7. For an *Improvement in Pessaries*; Jonathan H. Robinson, Charlestown, Middlesex county, Massachusetts, August 7.

Claim.—"What I claim as my invention, is forming a stem pessary, with a shield to fit around the labia, and to which the supporting straps may be connected, substantially in the manner and for the purpose specified."

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8. For an *Improvement in Bedstead Fastenings*; Henry Miller, South Bend, St. Joseph county, Indiana, August 7.

Claim.—"What I claim as my invention, is the combination of the cord and slat bottom, and use of pulleys, and the methods of suspending it; and also the method of straining the cord by the ratchet windlass."

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9. For an *Improvement in Cleansing Bottles*; Munson C. Crouk, Auburn, Cayuga county, New York, August 7.

The patentee says,—"The nature of my invention consists in applying the principle of hydrostatic pressure to the use and purpose of cleansing mineral water and beer bottles."

Claim.—"What I claim as my invention, is the application of the apparatus, substantially as set forth, for the purpose of cleansing bottles."

10. For an *Arrangement of Weight and Pulley for Closing Gates*; Willard Twitchell, Syracuse, Onondaga county, New York, August 7.

The patentee says,—“The nature of my invention consists in so attaching a pulley to the post of the gate, that its position will change with the change in the direction of the cord, as the gate is opened or closed, thereby enabling me to get the full effect of the weight with a single pulley.”

Claim.—“What I claim as my invention, is the application of a swivel pulley for closing a gate, when the cord to which the weight is attached is fastened to the gate below the level of the said pulley, whereby it acts not only as a gate closer, but also as a support to prevent the gate from sagging; the whole constructed substantially as described.”

11. For an *Improved Method of Regulating the Contraction of Car Wheels*; John Murphy, Kensington, Philadelphia, Pennsylvania, August 7.

Claim.—“What I claim as my invention and discovery, is the mode of cooling, and thereby regulating the contraction of chilled railroad car and other wheels and pulleys with solid hubs, by the application of a stream of cold air to the hub in the manner described, in combination with the non conducting case for retarding the cooling of the rim, as set forth.”

12. For a *Machine for Making Spiral Springs of Wire*; William Van Anden, Trenton, New Jersey, August 7.

Claim.—“What I claim as my invention, is the entire method herein described of making springs of curved character, in flat or spiral form, in the manner set forth, namely, by forcing the wire, by notched toothed wheels or otherwise, between friction rollers, tubes, or smooth bars, so as to form a wire spring into a curved and spiral form at the same time, by means of varying the tool as described. Also, the method set forth of varying the size of the curve, by moving the operating tool by a cam, inclined plane, or any similar mechanical contrivance.”

13. For an *Improvement in the Manufacture of Button Moulds*; Josiah Hayden, Williamsburg, and Rufus Hyde, Chesterfield, Hampshire county, Massachusetts, August 7.

The patentees say,—“Our improvement consists in so constructing the machine that, by inserting a strip between the upright plate and the friction roller which is attached to it horizontally parallel to its face, and setting the machine in motion, the whole strip will be worked into button moulds without any further attention to the machine.

“And in having two bits, in separate arbors, one to cut each side of the mould, but cutting at different times, alternately; the arbors of which bits receive a gradual vibratory motion toward and from the strip, by means of levers, one end of each of which levers works against the cam on one or other of the cam wheels, so that one is drawn back while the other is cutting. And by a ratch wheel, which is worked by a rack attached to one end of a lever, which causes the feeding motion at the proper time, so that the machine may be constantly fed.”

Claim.—“What we claim as our invention. is the use of the ratch wheels, rack, and lever, one or more friction rollers, rack, and lever, to produce the feeding motion, when combined with the method of holding the strip, and the alternate vibratory motion of the bits, produced by the operation of the cams, thus constituting a self-acting and self-regulating machine, when the whole is constructed, arranged, and combined substantially as herein described.”

14. For an *Eccentric Piano Lock*; Peter H. Niles, Boston, Massachusetts, August 7.

The patentee says,—“The distinguishing feature of my new lock is, that the bolt, which moves laterally, and is cut out in the ordinary way, so as to engage with a vertical hasp on the lid of the piano case or trunk, is operated by an eccentric, which fits into a proper hole in a metallic plate appended to, or cast on, the under side of the bolt, said eccentric being moved directly by the key.”

Claim.—“What I claim as my invention, is a piano case or trunk lock, in which the bolt is thrown out and in by an eccentric, substantially as herein above described.”

15. For *Improvements in Locomotive Spark Arresters and Smoke Conductors*; Josiah F. Flagg, Boston, Massachusetts, August 7.

Claim.—“I claim, in combination with the deflector for directing downwards the current of sparks in a locomotive chimney, the inverted conical jacket or cullender, when perforated with horizontal holes, and each hole furnished with flanches which project upward within,

and downward on the outside of, said jacket, whereby the sparks are directed down into the space between the jacket and the outer case of the chimney, and are prevented from raising upward, as set forth.

"I also claim, in combination with a horizontal chimney for locomotives, the mouth-piece or inhaler, having two upright partitions meeting in an edge or vertical line at the front, whereby the two parts of a divided current of air are made to pass around the sides of the interior chimney, and to unite beyond the opening which gives exit to the smoke or gases, in such manner as to augment the draft of the horizontal flue while avoiding the entrance of the air to the vertical part of the chimney.

"I also claim, in combination with a horizontal flue for locomotives, the movable inhaling valves, which form the lateral gorges for the purpose of creating draft within the horizontal flues, in the manner and for the purposes set forth, whereby the amount of draft may be increased or diminished at pleasure, whether the cars move with one or the other end foremost."

16. For an *Improvement in Cooking Stoves*; Nicholas Mason, Roxbury, Norfolk county, Massachusetts, August 7.

The patentee says,—“The nature of my invention consists in causing the heat and smoke from the fire chamber to pass over the oven, and down diving flues on the ends and back of the oven, and under the same towards the front part of the stove, when they descend and enter another flue immediately below, which conducts them to a vertical flue at the back part of the stove, leading to the smoke pipe, thus causing the oven to be entirely surrounded with heat when desired, to cook the meats in the oven alike on all sides.”

Claim.—“1st, What I claim as my invention, is the mode of forming diving flues at the ends of the oven, and opening and closing the communication through the same by means of the doors arranged inside the oven, and connected to the outer doors by links or hinged plates, and the swinging dampers operated by said inner doors, in the manner and for the purpose herein set forth; and, in combination with said flues, I claim the upper and lower horizontal flues and back diving flue, for conveying the heat around the oven and back into the smoke pipe, as indicated by arrows in the figure, and herein described.

“2d, I also claim the combination of the door on the side of the stove, with the box or drawer inserted in a corresponding formed case at the bottom of the stove, for the double purpose of forming a return flue for the smoke and heat, and a receptacle for soot, &c., cleaned from the flues, as described.”

17. For an *Improvement in Forming and Balancing Mill Stones*; Edmund Munson, Utica, Oneida county, New York, August 7.

The patentee says,—“The nature of my invention consists in the construction of a machine or apparatus on which the mill stone, after it is blocked up, is suspended upon its centre, and in balancing it there in the course of filling up and finishing, instead of filling up the same without the means of testing the accuracy of its balance, leaving that to be done by the millwright (as is usually the case) in hanging the stone for actual use in the mill.”

Claim.—“What I claim as my invention, is the mode herein described of testing and balancing mill stones, by being enabled, by the means here described, to observe the balance of the stone, while the same is in motion as well as at rest, and at the same time to correct the inaccuracies of its balance during the progress of construction.

“I also claim the use of the machine here described for turning off the exterior of the mill stone in finishing the same, as herein mentioned, in combination with the use of the same machine in testing the balance of the stone, as above set forth; the whole being arranged and combined substantially as herein set forth and described.”

18. For a *Reversible Life Boat*; George P. Tewksbury, Boston, Massachusetts, August 7.

Claim.—“What I claim as my invention, is the buoyant boat constructed with the opening, and the movable platform or floor placed within the same, and made to operate therein, substantially in the manner and for the purpose as specified. And, as auxiliary thereto, I claim the combination of one or more thwart frames, as constructed, applied to the same, and made to operate in connexion with the platform, essentially as described.”

19. For an *Improvement in Self-Acting Cheese Presses*; Ira Carter, Plattsburg, Clinton county, New York, August 14.

The patentee says,—“The nature and principle of my invention consists in providing a

movable elevating cheese table, and combining it with a cross-head lever having racks at the ends of its arms, and, by the peculiar combination of pinions and wheels, I am enabled to suspend the whole weight of the cheese table on the ends of the levers, and gradually decrease the space between the cross-head of the lever and cheese table, so as to press cheese curd or cheese that may be placed on the cheese table, by the lever bearing downwards on the same, by the weight of the cheese table and its appendages, suspended on the ends of the lever."

Claim.—"I claim the cross-head lever, constructed with the racks as described, in combination with the cheese table and the stationary racks, by means of the wheels and pinions, operated by the pinion J, in the manner represented, for the purpose of elevating the cheese table and the cross-head lever, but especially for exerting a continual self-acting pressure upon the cheese, by the space between the cross-head and the cheese table decreasing as the cheese is being compressed, substantially as described."

20. For an *Improvement in Road Scrapers*; Benj. M. Townsend, Quincy, Adams county, Illinois, August 14.

The patentee says,—"My invention consists in a device, by which the angle formed by the share with the line of draft can be changed while the scraper is in motion, and in the peculiar manner in which the upper edge of the share is connected with the hind end of the beam, by which it is securely attached to the beam when scraping, but easily and instantly disconnected therefrom to allow the share to turn and discharge the scraped earth."

Claim.—"What I claim as my invention, is the device, consisting of brace-rods, sliding eye-bolts, connecting rod, hand lever, and spring catch, for changing the angle formed by the share with the line of draft, arranged and operated substantially as set forth."

21. For an *Improvement in Rice Hullers*; Charles Walker, Brooklyn, Kings county, New York, August 14.

The patentee says,—"The nature of my invention consists in providing two conical rings or parts of cast iron, and these to be coated with vulcanized caoutchouc or India rubber, by which the surface of rice or other grain may be rubbed in a severe manner, so as to break and peel off the skin or hull of the grains of rice, coffee, or other grains, without pulverizing the inner part or grain itself."

Claim.—"What I claim as my invention, is covering the rubbing cylinder and concave, or other rubbing surfaces of rice, or grain hullers, with vulcanized India rubber, in the manner described."

22. For an *Improvement in Machines for Ruling Paper*; William S. Wilder, Boston, Massachusetts, August 14.

Claim.—"What I claim as my invention, is the expansion belt and projection, in combination with the endless apron R, and the machinery for gauging and delivering the sheets of paper thereto, substantially as specified; the said machinery being the endless aprons D and G, and the gauge."

23. For an *Improvement in Steam Tables*; Edwin Hills, Cincinnati, Ohio, August 14.

The patentee says,—"The object of my invention is a new and improved steam table, for heating crushed oil seed preparatory to subjecting the same to the action of the press, to extract the oil therefrom."

Claim.—"What I claim as my invention, is the combination of the hollow top and bottom of the tables with the hoop; the same being made and arranged substantially in the manner and for the purpose described."

"I likewise claim making the hollow top with a recess in its under side, into which to raise the stirrer while the hoop is being withdrawn, in the manner and for the purpose set forth."

24. For a *Method of Uniting Metallic Plates to each other*; Samuel Pratt, Cohasset, Norfolk county, Massachusetts, August 14.

The patentee says,—"The nature of this invention and improvement consists in making two or more incisions in the hoop plate, near the ends of the same, or in the pieces of metal to be joined, of the form of a right angle, by means of a punch or in any convenient manner, so as to cause the body of metal between the angular incisions in one plate or piece, or on one end of the hoop plate, to be raised above the surface of the same, and the metal between the angular incisions of the other plate, or opposite end of the hoop plate, to be depressed

below its surface, in such a manner as to allow of the projecting portions near one end of the hoop plate or piece of metal to be passed through the incisions near the opposite end of the hoop plate, or in the other metal plate, to be joined and locked into the same, and the projecting portions to be pressed together."

Claim.—"What I claim as my invention, is the mode of securing together the extremities of metallic hoop bands, to form hoops or metallic plates, by making angled incisions in the same, and locking the projecting portions of metal between the lines of said incisions into each other, and pressing or hammering them together, so as to form smooth surfaces above and below, in the manner described."

25. For an *Improvement in the Process of Flouring*; David P. Bonnell, Tecumseh, Lenawee county, Michigan, August 14.

Claim.—"What I claim as my invention and improvement, is the process of re-grinding the offal of wheat immediately after it has passed from the 'bolts,' and putting it through lower 'dusters' or 'bolts,' and returning the flour to the 'cooler,' to be re-bolted with the superfine flour; all by a continuous operation, after the manner described, so as to produce three new results: 1st, to get a greater quantity of superfine flour out of any given amount of wheat than is now obtained by any known method; 2d, by exhausting the moisture of the grain to prevent the flour from becoming sour; and 3d, to reduce the products to two kinds—superfine flour and a final residuum or bran, increasing the former and decreasing the latter or less valuable product; all as herein fully set forth."

26. For an *Improved Arrangement of Steam Boiler and Furnace thereof*; Horace Boardman, Plattsburg, Clinton county, New York, August 14.

The patentee says,—"The nature of my invention consists in giving to the fire box or combustion chambers of boilers the form of an inverted cone or pyramid, surrounded by a water case of the same general form, the thickness of the upper part of which is greater than the lower, and communicating at its upper part, by passages through the water casing, with an inverted pyramidal chamber, by which the products of the combustion are conveyed downwards and discharged below the fire box; the outer or gas chamber is of greater area at its top, where it communicates with the interior of the fire box, than it is at its bottom, where the spent gases are discharged. The combustion of the fuel in the fire box is maintained by a blast introduced in a wind chest beneath the grate, and heated by the spent gases; the inflammable gaseous products of the combustion are burned by the introduction of jets of air at the passages through the water casing."

Claim.—"What I claim as my invention, is giving the combustion chamber of boilers an inverted conical or pyramidal form, so as to make the area of the upper horizontal section greater than that of the lower, surrounding it with a water casing, and with a gas chamber, also of increased capacity at the top, and attaching the several parts to the flat bottom of a boiler which forms the top of the combustion and gas chambers; the water casing and the flat bottomed vessel being connected with each other, and the whole forming one boiler, the several parts of which are arranged substantially in the manner and for the purposes herein set forth."

"I likewise claim the injection of a jet or jets of air at the flues or passages which connect the combustion chamber with the gas chamber, for the purpose of igniting the gases and retarding their progressive motion towards the bottom of the gas chamber."

27. For an *Improved Arrangement of Filters for Steam Boilers*; Edmund Blunt, Brooklyn, New York, August 14.

The patentee says,—"The first part of my invention consists in using, in combination with the feed or supply pipe of steam boilers, and between the boiler and the supply pump or pumps, a series of two or more filters, so adapted and arranged that, after one filter has been used, the feed or supply water can be made to pass through another filter, and thus admit of cleaning the filters without interrupting the supply of water to the boiler."

"And the second part of my invention, which relates to the cleaning of the filters, consists in connecting the series of filters with the blow-off pipe of a steam boiler, that the water forced out of the boiler may be forced through the filters in the reversed direction, for the purpose of cleaning them out."

Claim.—"What I claim as my invention, is the combination of a series of filters with the supply or feed pipe of a steam boiler, and placed at some point between the supply pump and the boiler, substantially in the manner and for the purpose specified, whether the series be made to shift to the supply pipe or *vice versa*."

"I also claim the above combination of the series of filters and supply or feed pipe, in combination with the blow-off pipe of steam boilers, for the purpose and in the manner specified; and this I claim, whether the series of filters be made to shift to the blow-off pipe or *vice versa*, as specified."

28. For an *Improvement in Covered Buttons*; William R. Hitchcock & Co., Waterbury, New Haven county, Connecticut, assignees of Peter Kirkham, Birmingham, England, August 14.

Claim.—"I claim the forming of the button with its two parts, top and bottom, made of wood, joined together by appropriate fitting parts in the one to coincide with the other, to secure the textile covering inside, and the shank likewise, in the manner substantially as herein described, or in any other manner substantially the same."

29. For an *Improvement in Meat Cutters*; Allen Burdick, near Glenn's Falls, Saratoga county, New York, August 21.

The patentee says,—"My invention consists in the combination and arrangement of the vibrating spring beam with its knife stock and knives, the latter made to rise and fall vertically, and a rotating block on which the meat is minced; and also combining with these a boiler in which steam is generated, and made to escape and come in contact with the knives, for giving them a proper temperature to prevent the meat adhering thereto, and imparting to the meat a quality which greatly facilitates the process of seasoning."

Claim.—"What I claim as my invention, is, 1st, the use of the vibrating spring lever, for the purpose and in the manner described and represented.

"2d, I claim the use of steam for heating and moistening the cutters, as described."

30. For an *Improvement in Mills for Sawing Ship Timber, &c.*; John W. Cochran, London, England, August 21.

The patentee says,—"The first part of my invention relates to the mounting of saws in a saw gate, in such a manner as to admit of turning on their axes, and to slide laterally, for the purpose of cutting timbers in curved or diagonal lines, and consists in hanging the saws in swivels sustained on spherical friction rollers.

"The second part of my invention relates to the mode of turning saws mounted on stretchers, or otherwise adapted to swivel on the gate, and consists in connecting the swivels, or other turning apparatus to which the saws are attached, by means of feathers or ribs, on a tumbling shaft parallel with the saw, and connected with the swivels by means of arms or parallel motions, when this is combined with keys in which the feathers or ribs on the tumbling shaft slide during the motions of the saw gate, and by means of which the saw can be turned in any desired direction.

"The third part of my invention relates to the mode of determining the bevels of cuts on saw mills, in which the log or timber is so hung as to admit of sliding laterally and turning on any determined axis of motion, and consists in determining the bevel to be cut, by means of a graduated circular plate attached to the mandril that carries the log, when this is combined with a horizontal hinged bar on a horizontally sliding frame, so that when the hinged bar is set to any given angle for the determined bevel, and the graduated plate is set to the bar, the log or timber may be moved, that, as the log advances towards the saw, the given graduation on the plate may be made to follow the hinged bar, and, after a length has been cut, the sliding frame to which the bar is hinged may be moved for a continuation of the operation."

Claim.—"What I claim as my invention, is the mode of turning saws mounted upon stretchers or otherwise, within the saw gates, by means of feathers or ribs, with the arms or parallel motions connected therewith, and operated by keys, as herein before described.

"And I also claim the mode of determining the bevels of cuts to be made in my said improved sawing machine, by means of a graduated semi-circular board and sliding frame, as hereinbefore described."

31. For an *Improvement in the Manufacture of Buttons from Straw Board*; Elisha M. Pomeroy, Wallingford, New Haven county, Connecticut, August 21.

The patentee says,—"The nature of my improvement consists in preparing the said buttons for the reception of a coat of varnish, by a newly discovered, and, as is believed, the only practicable method."

Claim.—"What I claim as my invention, is the mode or process of preparing the buttons

aforesaid for the reception of a smooth coat of varnish, which process consists in removing the roughness from the surface of the buttons after baking them a second time, by revolving them in a cylinder with linseed or other fixed oil, and again baking them until the said oil becomes dry and hard, and impervious to the varnish as aforesaid; all substantially in manner and form as above described; which said process is peculiar to the use of straw board in the manufacture of dead-eye buttons, and essential in the use of that material, and whereby an equally good button can be afforded at nearly one-half the cost of the ordinary paper button manufactured by me in the method secured to me by letters patent of the United States, of September 23d, A. D. 1843.

32. For an *Improvement in Fire Proof Safes*; Edward and Joseph L. Hall, Cincinnati, Ohio, August 21.

Claim.—"What we claim as new, is the manner of joining the interior to the exterior casing, by bolts or rivets imbedded in the insulating cement, substantially as set forth, whereby it is rendered more capable of resisting the action of fire, or external force applied to break it open.

"We likewise claim the employment, in chests so joined by bolts, of hydraulic cement as the insulating material for fire proof safes or chests, it being stronger when concreted than other cements heretofore used for that purpose, and therefore making a safe of superior strength and durability, especially when the same is constructed upon our concrete principle, herein described."

33. For an *Improvement in Planetariums*; Benjamin O. Swain, Annisquam, Essex county, Massachusetts, August 21.

Claim.—"What I claim as my invention, is as follows: I claim the arrangement of the orbit of each planetary ball, excepting those representing the Earth and Mercury, in a vertical plane, in combination with overloading one side or part of said ball, in such manner that the action of gravity shall operate to rotate the ball once during each revolution of it about the sun, or, in other words, preserve the parallelism of the axis of the ball throughout its entire revolution; the said improvement enabling me to illustrate the seasons at each of the planets excepting the Earth and Mercury.

"I also claim the method of applying the lamp so as to illuminate the globe L, (the Sun,) the same consisting in arranging the lamp on the outside of the globe, and extending the wick tubes into and through an opening made in the globe and around its axis of rotation, as specified.

"I also claim the arrangement of the inferior planets, and the mechanism for operating them, with respect to the Sun and the superior planets, and their operating mechanism; the said arrangement enabling me to get the inclined motions of the inferior planets, and, by so doing, to illustrate the doctrine of the transits. This arrangement consists in placing the machinery, by which the inferior planets are moved, on the opposite side of the Sun to that on which the other planets and their operating machinery are disposed. The vertical zodiac is so arranged that the equinoctial points are in a horizontal line, and the solstitial points in a vertical line; the vernal equinox being on the left, the autumnal falls upon the right.

"The ascending node of Mercury is in the last of the sign Taurus, or in that point of the zodiac which is reached by the Earth on the ninth or tenth of November; the descending node is, of course, at the opposite point. The machinery which operates the planet Mercury, carries it across the plane of the Earth's motion at these points.

"I also claim the combination of mechanism by which the annual and diurnal revolutions of the Earth S are produced, and by which the parallelism of the Earth's axis during its annual revolutions is preserved, the said machinery consisting of the stationary grooved zodiacal wheel, and endless belt thereon, the forked arm, its supporting shaft and rotating mechanism, the pulley, tubular shaft, pinion, gear, cylindrical block and shaft, pulleys and their endless band; the whole being applied to the globe S, and made to operate substantially as specified."

34. For an *Improvement in the Manufacture of Car Wheels*; Edward Finch, Liverpool, England, August 21.

Claim.—"What I claim, is the above described improvement in the manufacture of a wrought iron wheel for railway carriages, viz., by contracting or compressing the tire and its lips down upon a dove-tailed rim while the tire is heated, as specified; whereby the parts are united by a continuous dove-tail joint, as explained, thereby avoiding, in the use of such a wheel, many liabilities to accident to which other wrought iron wheels are subject."

35. For a *Combined Sash and Inside Shutter Fastener*; A. D. Baldwin, assignee of James Bell, City of New York, August 21.

Claim.—"I claim at new, the herein described method of fastening window sashes and inside shutters, by means of two pieces of metal, hinged together, or one entire piece, binding the sashes and shutters by the addition of a plate and screw, so that they can only be opened from the inside; the whole constructed and operating substantially as described."

36. For an *Improvement in Treenail Machines*; Josiah Kirby, Cincinnati, Ohio, August 21.

The patentee says,—"The nature of my invention consists in making treenails, for ship-building and other purposes, by forcing the timber between sharp bits or knives. These bits are arranged on a main head at suitable angles with each other, so as to shave the pin, as it passes through the head, square or otherwise. They are also, by means of a rock-shaft and slide connexions round the head, made to close their edges gradually on the treenail as it is forced through between them, at once squaring and tapering it."

Claim.—"What I claim as my invention, is the combination of the bit with the bit-holder and the head, and the bits, rod, and flanch, constructed and operating substantially in the manner and for the purpose herein described."

37. For an *Improved Self-Acting Sash Fastener and Stopper*; James C. Cochran, Rochester, New York, August 21.

Claim.—"What I claim as my invention, is the combination of the case, made as described, with the bolt, also made as described, by which the bolt is made to self-act in locking the sash to the window frame, the spiral groove in the case acting against the cog projecting from the periphery of the bolt, to move the latter forward and throw it into the thimble of the frame, as the bolt is turned by the descent of the outer extremity of the handle in the arc of a circle; the bolt being again withdrawn from the thimble, to unlock the sash, by simply raising the outer end of the handle in the same arc of a circle, as set forth."

38. For an *Improvement in Ice Cream Freezers*; John Decker, Belle Air, Harford county, Maryland, August 21.

The patentee says,—"The nature of my invention consists in locating and securing a tube, A, in the centre of the body of an ice cream freezer, for the reception of the tube B, secured to, and descending from, the cover, for the purpose set forth."

Claim.—"What I claim as my invention, is the location of the tube A within the body of the freezer, and forming a part of the same, when combined with the ice tube B, descending from, and made fast to, the cover, substantially in the manner and for the purpose set forth."

39. For an *Improved Angular Rotating Tuyere*; Samuel H. Camp, Hartford, Connecticut, August 21.

The patentee says,—"The nature of my invention consists in the employment of a square, rectangular, hollow revolving grate or tuyere iron, for forges, perforated with apertures of different sizes, forming bars in the sides, for regulating the admission of air into the fire of the forge, and for breaking the scale of metal by edges of the grate or tuyere iron, when it is revolved to prevent the tuyere from being choked."

Claim.—"I claim the tuyere, of a square, rectangular, or hexagon form, having edges, and revolving, not on an eccentric axis, but a central axis, to break off the scale formed by the fire upon the metal, by turning round the tuyere, when such tuyere is constructed hollow, and with apertures of different sizes upon its different faces, through which the blast is forced; the whole being constructed substantially as described."

40. For a *Combined Piston-Breech and Firing-Cock Repeating Gun*; George A. Arrow-smith, assignee of Walter Hunt, City of New York, August 21; anté dated Dec. 10, 1847.

Claim.—"What I specifically claim as new, is the construction of a hollow sliding or piston breech pin, which is operated by a lever in loading and securing the charge in the breech of the gun, which breech-pin, in addition to the above characteristic, contains, or has attached to it, the main spring, firing-cock, or punch, and firing-chamber of the priming.

"I also claim the mode of transferring the priming from the fixed magazine to the firing-chamber, in or by means of the said sliding breech-pin, as above set forth and described."

41. For an *Improvement in Inkstands*; Andrew Fife, Philadelphia, Pennsylvania, August 21.

The patentee says,—"The object of the 'Gold Pen Protector' is to interpose a soft elastic substance between the pen and the hard substances composing the inkstand and its reservoir, in such a way as to greatly decrease, if not entirely remove, the danger of breaking the point of the pen in taking a dip of ink."

Claim.—"What I claim as my invention, is forming the top, or surface surrounding and partially covering the mouth of the reservoir of the inkstand, of gum elastic, or other similar soft elastic substance or composition, substantially in the manner and for the purpose herein described."

42. For an *Improvement in Dining Tables*; John C. Nichols, Woburn, Middlesex county, Massachusetts, August 21.

Claim.—"I claim, in combination with the rotary tablet A, the supporting pier and tablet B, the mechanism for elevating, depressing, and sustaining the rotary tablet somewhat above the stationary tablet, in manner as described, and for the purpose of preventing plates, dishes, or articles, which may be placed on the tablet B, from improperly interfering with the movements of the rotating tablet.

"Furthermore, I claim the manner described of constructing and combining the leaves and middle parts of the two tablets, whereby the two leaves on each side of the centre of the table may be simultaneously and together turned down into a vertical position, so as to cause the table to have advantages usually possessed by a common two-leaved table."

43. For *Improvements in Rotating Spike Machines*; Edwin B. White, Nashua, Hillsborough county, New Hampshire, August 28.

Claim.—"What I claim as my invention, is as follows: that is to say, I claim, in combination with the movable gauge and pointing dies, the ducts or passages made in the gauge, for the distribution of the water on the dies, as described.

"I also claim the hopper and its slide, in combination with the conductor and its movable frame, the whole being made to operate together substantially as above explained."

44. For an *Improvement in Planing Machines*; Reid R. Throckmorton, Brooklyn, New York, August 28.

The patentee says,—"The nature of my invention consists in giving to the planing bits two motions in the operation of planing, viz., a rotary motion about an axis, and a reciprocating motion across the face of the board, that the planes, while acting on the board, may generate a curve due to these two motions instead of a segment of a circle, and give what is termed a draw-cut."

Claim.—"What I claim as my invention, is giving to the plane irons, in passing over the board, a compound motion, one around the axis of their shaft, and the other rectilinear reciprocating, substantially as described, by giving to the shaft that carries the face wheel a rectilinear reciprocating motion, in combination with a rotary motion, in the operation of planing, substantially as described."

45. For an *Improvement in Machinery for Cutting Screws in Bedsteads*; Joseph Garside and Henry J. Betjemann, Harrison, Hamilton county, Ohio, August 28.

Claim.—"What we claim as our invention, is the combination of the driver or clearer with the hollow cylinder tap, for keeping the cutter clear of chips during the operation of cutting the female screw in posts for bedsteads, and for other purposes, substantially as described."

46. For a *Method of Connecting the Hammer with the Cylinder of a Revolving Fire Arm*; Edwin G. Ripley, administrator of Edwin Wesson, Hartford, Connecticut, August 28.

Claim.—"What I claim as new, is the employment of the bevel gear introduced into the lock, substantially in the manner and for the purposes set forth, so that two or more chambers can be employed in the cylinder, and chambers of any desired calibre, by changing the relative proportions of the gear, without changing the motion of the hammer."

47. For an *Improvement in Machinery for Dressing Treenails*; Jesse Fitzgerald, City of New York, August 28.

Claim.—"What I claim as my invention, is the combination of the cutters with the enlarging and heading apparatus, viz., the cam, the elevating piece T, with f, U, and h."

48. For an *Improvement in Sugar Pans*; Alfred Stillman, City of New York, August 28.

The patentee says,—“The nature of my invention consists in connecting the two domes of the pan by means of a pipe above the top of the pan, with the end in the first dome turned up to prevent, in part, the foam from the liquid to pass up into the pipe, and turned down in the second dome, for the free discharge of the liquid particles which may be carried over by the vapor.”

Claim.—“What I claim as my invention, is connecting the two domes of the evaporating pan by means of a pipe above the top of the pan, the end of which, in the second dome, is turned down, substantially in the manner and for the purpose described, whether the said pipe be inclined downwards from the first to the second dome, or be horizontal, as described.”

49. For an *Improvement in Fountain Pens*; David O. Macomber, City of New York, August 28.

The patentee says,—“My improvements consist in simple means for so applying and regulating the hydrostatic pressure of the fluid, that each pen is portable, safe, and always ready for use.”

Claim.—“What I claim as new, is the application of a conical metal point or plug, acting in a conical tube set eccentrically with the axis of the main tube, for the three purposes of guiding the ink to the nibs of the pen, of regulating the supply of ink, and for securing the ink in the tube when not in use, substantially as described and shown.”

50. For a *Method of Working the Air Pump, and Using a Condensing as a Non-Condensing Engine*; R. F. Loper, Philadelphia, Pennsylvania, August 28.

The patentee says,—“The nature of my improvement consists in the arrangement of the engine within a vessel for propelling, and the peculiar combination of the air pump therewith, together with the method of converting the engine at once into a condensing or non-condensing engine.”

Claim.—“What I claim as my invention, is, 1st, the combination of the air pump with the engine, in the manner set forth, by which I work it more easily, and reduce the number of actions of the valves one-half less than can be done in the ordinary way; I also claim the arrangement for converting the engine into a condensing or non-condensing engine, by opening or closing a free vent for the steam from the condenser, as set forth.”

51. For an *Improvement in Bedstead Fastenings*; Simeon Hovey, Painesville, Lake county, Ohio, August 28.

The patentee says,—“The nature of my invention consists in inserting in each post of a bedstead a socket iron, with which the tenons of two adjacent rails are engaged.”

Claim.—“I claim the mode of holding in the block of metal containing the catches or locks into which the contiguous end of the rails are locked, whereby the metal has a firm bearing against the wood of the inner corner of the post, on whichever rail the strain of the pulling comes, as described.”

52. For a *Combined Construction and Operation of the Drill in Rock Drilling Machines*; George N. Doan, Millerstown, Perry county, Pennsylvania, August 28.

Claim.—“What I claim as my invention, is giving to a drill, having its cutting edges beveled as herein described, a compound longitudinal and rotary motion, substantially in the manner and for the purposes described, but irrespective of the devices by which said compound motion is produced.”

53. For a *Gold Washer*; Michael English, Lagro, Wabash county, Indiana, August 28.

Claim.—“What I claim as new, is the combination of the helical revolving screen, with the dashers upon its periphery, and the conical frustrum with a screw therein, by which arrangement the larger and smaller particles are separated, and the latter washed, at one operation; all of which is arranged substantially in the manner and for the purpose set forth.”

54. For an *Improvement in Hill-Side Ploughs*; John W. Thurman, Buchanan, Lewis county, Virginia, August 28.

The patentee says,—“My invention consists in attaching a right and left-hand mould-board, with their respective shares, &c., to the opposite sides of a revolving shaft extending across

the beam, so that they may be turned to place either share beneath the beam, where it is secured by a sliding stop in the proper position to turn the furrow, which may thus be thrown to the right or left as the operator desires."

Claim.—"What I claim as my invention, is the double or right and left-hand mould-boards, revolving upon a horizontal shaft placed across the beam, as herein described, using for that purpose cast or wrought iron, or any other material that will answer the desired purpose."

55. For an *Improvement in Straw Cutters*; Lewis Tupper, Auburn, Cayuga county, New York, August 28.

The patentee says,—"The nature of my invention consists of the arrangement of two long lever rods, on opposite sides of the straw-cutting machine, in combination with levers and clicks that operate on ratchet wheels on the ends of the feeders or rollers for carrying the straw or hay forward under the knife, in the operation of cutting, the straw or hay being cut off in equal lengths by a knife that slides vertically, and is moved by a crank in gear with it.

Claim.—"I claim the combination of the reciprocating arms with the ratchet levers or clicks, in the manner substantially as described, and for the purposes set forth."

56. For an *Improvement in Threshing Machines*; Abram Bloom, Newville, Cumberland county, Pennsylvania, August 28.

The patentee says,—"The nature of my invention consists in the application of adjustable teeth to the concave, by which the dimensions of the spaces through which the straw passes are regulated according to the nature of the material to be operated upon."

Claim.—"What I claim as my invention, is the employment of adjustable teeth, turning upon pivots, on the concave of threshing machines, substantially in the manner and for the purpose herein described."

57. For an *Improvement in Spinal Supporters*; Henry G. Davis, Millbury, Worcester county, Massachusetts, August 28.

Claim.—"I claim as my invention and discovery, the combination and arrangement of the steel plates, and the bands, combined as occasion requires with a band or bands F, all the parts being so formed as to be capable of being united, in the manner and for the purposes set forth in the specification, and constituting, when so in union, a machine which gives support to the body, when afflicted with any disease which makes such support useful."

58. For an *Improvement in Chucks*; James W. Martin and Edwin Parry, Northern Liberties, Philadelphia county, Pennsylvania, August 28.

Claim.—"What we claim as our invention, is the arrangement and application of two or more geared sectors, or toothed wheels, with the jaws or pins affixed and meshing into a pinion, as described, in combination with the spur wheel and screw."

59. For an *Improvement in Spring Seat Saddles*; Robert Smith, Leesburg, Cumberland county, Pennsylvania, August 28.

The patentee says,—"The nature of my invention consists in giving great elasticity to the seat of the saddle by an arrangement of springs attached to the tree; the weight of the rider is sustained on spring steel strips; these are not only elastic in themselves, but are rendered additionally so by an elliptic spring concealed in the cantle."

Claim.—"What I claim as my invention, is the combination of the elastic strips, for supporting the seat, with the spring contained in the cantle of the saddle-tree, substantially in the manner set forth."

60. For a *Machine for Bending the Lips of Wrought Iron Railway Chairs*; Matthias P. Sawyer and John W. Hall, Boston, Massachusetts, assignees of Samuel A. Cox, Malden, Middlesex county, Massachusetts, August 28.

Claim.—"What I claim as my invention, is the combination of the former, the bending levers, or bending apparatus, and the base block for supporting the chair blank; the whole being constructed and made to operate together essentially in the manner and for the purpose specified; the drop hammer being employed in combination with the former, the base block, and bending apparatus, substantially as described."

61. For an *Improvement on Graduating Carpenters' Squares*; Dennis J. George and Norman Millington, South Shaftsbury, Bennington county, Vermont, August 28.

The patentees say,—"The nature of our improvement consists in providing as many chases as we desire to impress different configurations on the different sides of the bar and tongue of the square, which chases are filled up with properly fitted steel dies, after the manner of printing types, being correctly graduated, so as to make all the divisions and sub-divisions suitable for the sides upon which the impression is to be made, and then placing the side of the square on to the face of the dies, and passing it under the roller press to give the impression."

Claim.—"What we claim as our invention, is, 1st, the method of spacing or graduating metallic squares or rules with steel types or dies, and with or without figures, in combination with the roller press, suspended in a frame, so that the weight or pressure shall be brought below the centre, and as near the plane of the periphery of the roller as may be consistent with strength to bear the pressure.

"2d, The arrangement of the roller, frame, and yoke, so as to be raised or lowered by the lever, all as above specified, and for the purposes therein mentioned."

62. For an *Improvement in Machinery for Jointing Staves*; Samuel Jobs, Moundsville, Marshall county, Virginia, August 28.

The patentee says,—"The nature of my invention consists in giving an oscillating motion to the stave carriage, while the stave upon it is acted upon by a double-ironed plane, in such manner that, while the proper bevel is given to the stave, it, at the same operation, receives the proper taper in each direction from its centre."

Claim.—"What I claim as my invention, is combining an oscillating stave carriage with a reciprocating plane, in such manner that the former shall be operated by the latter, substantially in the manner herein set forth."

ADDITIONAL IMPROVEMENT FOR AUGUST, 1849.

1. For an *Improved Lever Scale for Canals, Railroads, &c.*; Ely Ellicott and Samuel A. Abbott, Philadelphia, Pennsylvania; patented February 6, 1849, additional improvement annexed August 14.

The patentees say,—"The nature of our improvement consists in placing on the top or base of the lock, dock, canal, or other desired place, two chairs or supports, at proper distances apart, to keep in position the suspended levers, (which are angular or bell-crank levers having fulcrums,) and running on each side of said lock, dock, railroad, &c., which angular or bell-crank levers give the first action to the scale, and by the multiplication of said levers and chairs, the scale may be extended to any required length, and by placing at one end of the scale a reversed angular lever, the proper action will be given to the beam, and dispensing with the simple levers, as described in our patent dated the sixth day of February, 1849."

Claim.—"What we claim as new, is two angular or bell crank levers, in combination with a reversed angular lever, to be connected together by rods, substantially as herein described, and placed on each side of the top or base of a lock, dock, canal, or other desired place; said lever to be connected to a graduated beam, and by the multiplication of which levers, a scale may be formed strong enough for any purpose, and weighing with entire accuracy; dispensing with the right or horizontal levers, as described in our letters patent for improved lever scale, which letters patent are dated February 6, 1849.

RE-ISSUE FOR AUGUST, 1849.

1. For an *Improvement in the Manufacture of India Rubber Goods by means of Zinc Compounds*; Henry G. Tyer and John Helm, New Brunswick, Middlesex county, New Jersey; patented January 30, 1849, re-issued August 7.

The patentees say,—"The nature of our invention consists in forming a compound of caoutchouc, carbonate of zinc, or other preparations of that metal, as hereinafter mentioned, with sulphur, which is perfectly elastic, impermeable to air or water, unchangeable in extreme temperatures, preserving its color without 'bloom,' and free from the deadly action upon the constitution and health hitherto experienced by the operatives employed in the preparation of metallic or vulcanized rubber."

Claim.—"What we claim as our invention, is India rubber fabrics, made by the combination of caoutchouc in its several varieties with zinc compounds in their several forms, as

herein set forth, and sulphur, and, in combination with these, the submitting our compound to the action of a high degree of heat; the whole being combined and manufactured substantially as described."

DESIGNS FOR AUGUST, 1849.

1. For a *Design for Stoves*; Joseph G. Lamb and Conrad Harris, Cincinnati, Ohio, August 7.
2. For a *Design for Stoves*; Pease, Keeney & Co., assignees of William L. Sanderson, Troy, New York, August 21.

The claim to each of the above patents is for the designs as represented in the specifications.

List of American Patents which issued in September, 1849, with Exemplifications by
CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

1. For an *Improvement in Spring Mattresses*; Patrick O'Neil, Philadelphia, Pennsylvania, September 4; anté dated August 4.

Claim.—"What I claim as my invention, is the mode of regulating the elasticity of the mattress, so as to increase or diminish the pressure on any part of the person using it, by the means and for the purposes hereinabove described. Furthermore, I claim the use of the bolts and the tubes, substantially in the manner and for the purposes set forth."

2. For an *Improvement in Bedstead Fastenings*; James Taylor, Macon, Bibb county, Georgia, September 4.

Claim.—"What I claim as my invention, is the nuts for tightening and loosening the hooks upon the bars, substantially as set forth."

3. For an *Improvement in Axles for Carriages*; John J. Flack, Joliet, Will county, Illinois, September 4.

The patentee says,—"The principle object of said improvement is to do away with friction, so that any given weight can be moved or transported with a comparatively small power, or that a comparatively small power will serve to move or transport any given weight, with much more ease and facility than it can be done without such improvement."

Claim.—"What I claim as my invention, is making the axle concavo-convex, combined with the friction rollers placed in the concavities thereof, in such a manner that the rollers shall protrude from the underside of the axles, downward, and rest upon the boxes in the hub, (the upper side of the said friction rollers are never to come in contact with the concavity of the axles,) having the whole load or burden supported by the rollers, and thereby save a large amount of friction which occurs in using the common or sliding axles."

4. For an *Improvement in Brakes for Railroad Cars*; Horace T. Robbins, Lowell, Middlesex county, Massachusetts, September 4.

Claim.—"What I claim as my invention, is the adjustable chisel in its combination with the brake-tread of each brake, the same being made to operate in manner and for the object specified.

"And I also claim the combination of mechanism for elevating the treads of the brakes from the rails, the same consisting of the shaft, the parts constituting the clutch, and the levers, chains, and windlasses connected therewith, the whole being applied together and made to operate essentially as described."

5. For a *Machine for Crushing Ice*; Alfred C. Hobbs and John Brown, City of New York, September 4.

The patentees say,—"Our improvements consist in applying a hopper, with one diagonal fixed side and two parallel sides, to contain the ice, and compressing the ice by a movable fourth side, the fixed diagonal side and moving side having within them dental projections cut or cast on, to operate downwards, and prevent the ice rising in the hopper when com-

pressed, and also enter and split the ice, and the combination with these parts of a lever fitted with an eccentric or cam-formed point, the power of which lever is greatest at commencing the compression, when the mass of ice offers the greatest resistance, and the point or centre, supporting the moving side of the hopper, being set away from the vertical line forming the common centre of the hopper, the motion given by the lever brings the moving diagonal side nearer to a parallel line with the fixed diagonal, and compresses the ice between them, so as to crush it, precisely in the manner that it would be crushed between the jaws of a living animal."

Claim.—"We claim as new, the application of a dental-faced crushing side to a hopper, such face being movable in a centre eccentric with the body of the machine, such application being made in combination with a cam-pointed lever, formed as described and shown, when such application and combination is used for the purpose of crushing and pushing out the ice by the same movement which crushes it, and, while crushing, presses hardest while the mass of ice is strongest; the whole operating substantially as described and shown."

6. For an *Improvement in Machines for Weaving Harness for Looms*; Simeon Holton, Jr., and William R. Harris, Middlebury, Addison county, Vermont, September 4.

The patentees say,—"The nature of our invention and improvement consists in combining, arranging, and operating certain mechanism, in such manner as to form weavers' harness by machinery, instead of other means heretofore used."

Claim.—"What we claim as our invention, is the method of making weavers' harness by power machinery, substantially as described, whether the carriage containing the harness frame, and the shuttles containing the twine, be operated by the combination of mechanism described, or any other which may be substantially the same, and by which analogous results are produced."

7. For an *Improvement in Machines for Cutting Paper*; William Johnson, assignee of Alonzo Gilman, Troy, New York, September 4.

Claim.—"What I claim as new, is the combination and arrangement of the guide-bar, slide-rest, and adjustable cutter, in connexion with a press or clamp for securing the paper so cut, in the manner and for the purpose substantially as set forth."

8. For an *Improvement in Apparatus for Operating Shuttle Boxes for Looms*; Charles J. Gardner, Northern Liberties, Philadelphia county, Pennsylvania, assignee of Andrew Allen, Wilmington, New Castle county, Delaware, September 4.

The patentee says,—"The nature of my invention consists in providing and affixing a lever to the plain power loom, with a shoe attached to said lever, that rises and falls by means of studs affixed in a circular dial plate, thus raising and lowering the shuttle boxes by means of a rod connecting with said lever and the box rod, which enables the operator to weave any desired pattern of check or stripe."

Claim.—"What I claim as my invention, is the wheel, having apertures (or other devices for holding the studs) arranged in radial lines, or nearly so, in combination with the movable studs and the shoe, or its equivalent, upon the weighted lever, for raising the shuttle box, and allowing them to fall, substantially as set forth."

9. For an *Improvement in Moulds for Making Glass Pipes*; D. O. Ketchum, assignee of George Scott, Albany, New York, September 4.

Claim.—"What I claim as my invention, is not simply the invention of a mould for blowing glass, but I claim the invention of a mould of the shape above described, open at each end, placed in a horizontal position, expressly for blowing uniform glass water pipes."

10. For an *Improvement in Machines for Cutting Welts*; Samuel Keen, Jr., East Bridgewater, Plymouth county, Massachusetts, September 4.

Claim.—"What I claim as my invention, is the application of a gauge or gauges to a skiver, whereby welts for boots and shoes may be formed substantially in the manner described."

11. For *Improvements in Eccentric Sash Fasteners*; Lewis B. Page, Hartford county, Connecticut, September 4.

The patentee says,—"The nature of my improvement consists in a self-acting cam whose

edge is notched; by the action of this cam the sash can be held in any position, and securely locked at its lowest, without being affected by any inequalities in the sash frame."

Claim.—"What I claim as my invention, is the combination of the spring with the notched cam, whereby the latter is rendered capable of holding the sash where the simple cam would be insufficient, and is also forced to enter the slot for locking the window."

12. For an *Improvement in Machines for Turning Leaves of Books*; J. H. Schomacker and Martin Kuernerle, Philadelphia, Pennsylvania, September 4.

Claim.—"What we claim as our invention, is, 1st, the arms with their fingers, in combination with the lever operated by the circular or coiled spring, and the slide and cord, in the manner and for the purposes set forth.

"2d, The catch plate, with its graduating screw, and the guard attached to the lever, for the purpose of catching the pendants, as described.

"3d, In the lever, so combined with the catch plate and guard, we claim the joint, guide, and longitudinal spring, for the purpose set forth.

"4th, The combination of the pillar, washers, rings, and pin, to form independent bearings for the several arms, as described."

13. For a *Method of Reversing Re-Acting Rotary Engines*; C. M. Miles, Brockwayville, Jefferson county, Pennsylvania, September 4.

The patentee says,—"The nature of my invention consists in the construction of a rotary steam engine, the peculiar and important feature of which is the employment of an escape tube, having two reversed elbows at its extremities, enlarged towards their mouths like a trumpet, thus affording an opportunity of great and rapid expansion to the steam, which thereby gives motion to the engine by counter pressure."

Claim.—"I claim the mode of reversing the motion of the engine, by a rack passing through the shaft thereof, and meshing into a pinion on the revolving nozzles, in the manner substantially as described."

14. For *Improvements in Street-Sweeping Machines*; Calvin S. Bishop, Easton, Northampton county, Pennsylvania, September 4.

Claim.—"What I claim as my invention, is, 1st, arranging two brush wheels abreast in the same machine, substantially as described and for the purposes stated.

"2d, I claim the articulated inflected sweeping plane, composed of two or more curved or inflected sections, attached to the carriage in such a manner that each section may have either a transverse, vertical, or undulatory motion, substantially as described; and this I claim whether such sections be connected to each other, as described, or irrespective of such attachment."

15. For an *Improvement in Cooking Stoves*; David Johnston, Amsterdam, Jefferson county, Ohio, September 4.

Claim.—"What I claim as my invention, is the movable back plate, and top plate containing boiler holes, constructed, arranged, and combined, substantially in the manner and for the purposes designated."

16. For an *Improvement in Machines for Making Wire Heddles*; Abijah J. Williams, Utica, New York, September 11.

The patentee says,—"The nature of my invention and improvement consists in a certain new and useful combination and arrangement of mechanical devices, by which a continuous piece of wire is cut off from the skein of wire on the reel, as it is fed into the machine between rollers, and seized by a hook at the middle of its length, and doubled or folded whilst being drawn into the cylinders, where it is held firmly by pincers and vibrating teeth passing between the strands, whilst the cylinders are made to revolve and twist the wires and form the heddles, and then cause the pincers to open, withdraw the vibrating teeth, and discharge the heddles in a finished state."

Claim.—"What I claim as my invention, is the before described mode of making wire heddles from a skein or hank of wire, by power machinery, by cutting the wire as it is fed into the machine, into suitable lengths to form, when doubled, the required heddles, and to drop said wires separately on to a horizontal reciprocating feeding and discharging hook-rod, by which each wire is doubled into two strands, and drawn into the centre of two revolving cylinders turning in contrary directions, wherein the strands are held by pincers and vibrating teeth forced between them, until they are twisted into the form of the required heddle, when

the heddle is discharged from the face of the cylinders by the reciprocatory movement of the hook-rod; the movements of the several parts of the machine to effect the aforesaid object being produced by a combination and arrangement of mechanism similar to that herein described, or any other which may be substantially the same, and by which analogous results are produced."

17. For an *Improvement in Can Hooks*; George Webber, Portland, Maine, September 11.

The patentee says,—“The nature of my invention consists in providing a fulcrum bar, in combination with diagonal jaw-levers, so that each jaw-lever has a fulcrum in the bar, thereby giving this machine more lever to grasp and retain blocks of wood, ice, or stone, than if the two jaw-levers were united and combined by a bolt passing through them where, or at a part where, they intersect each other.”

Claim.—“What I claim as new and useful, is the combination of the fulcrum bar with the jaw-levers, for the purpose and in the manner substantially as described.”

18. For an *Improvement in Cotton Gins*; Stephen R. Parkhurst, City of New York, September 11.

Claim.—“What I claim as my invention, is the combination of the toothed cylinder with the screw cylinder, both having their outer surface formed substantially as described, and working together in the manner and for the purpose above set forth. I am aware that toothed cylinders have heretofore been essayed in connexion with grooved rollers for ginning cotton, but when this has been done, the grooves have been made directly around the cylinder, or, if spiral, have been arranged in lines so nearly parallel with the axis of the cylinder as to operate like beaters, or to force the bolls so rapidly to the end of the toothed cylinder as to prevent them from being properly ginned. I, therefore, do not claim the toothed cylinder in combination with such grooved cylinders, but only with those having small spiral grooves around their surfaces, running nearly at right angles to the axis thereof, substantially as described.

“I am also aware that card cylinders have been used in connexion with toothed cylinders to strip off the cotton, but in such cases the advantage of delivering the cotton by a current of air directly through an opening is not attained. And I am also aware that brushes, attached to the ends of the arms or fans of blowers, have been used in connexion with toothed cylinders, to brush the cotton therefrom, to be thence passed out through an exit mouth in the case of the blower; but in such cases the cotton, when brushed from the cylinder, is rolled and becomes knobbed on the ends of the brushes, and tends to fall upon the bottom of the case of the blower. But in my said invention, the cards on the ends of the arms or fans hook the cotton from the toothed cylinder, and carry it forward without rolling or knobbing it, or allowing it to drop, until it reaches the exit mouth, where it is slipped off the teeth by the current of air, and carried through the opening to any convenient receptacle, with the fibres free from rolls and knobs. I, therefore, also claim the blower, constructed with cards on the arms or fans, in combination with toothed ginning cylinder and exit mouth, substantially as described and for the purpose set forth.”

19. For a *Machine for Forming the Eyes of Hinges*; David W. Lyon, West Troy, Albany county, New York, September 11.

The patentee says,—“The nature of my invention consists in certain presses and levers, by which to bind the blank and form the eyes of the hinges.”

Claim.—“What I claim as my invention, is the lever, formed and made to move in a compound direction, essentially in the manner herein described, in combination with the spring slide, by the joint action of which the eye of the hinge may be turned.”

20. For an *Improvement in Jointed Pawls*; Samuel S. Walley, Philadelphia, Pennsylvania, September 11.

Claim.—“What I claim as my invention, is the combination of the pawl with the lever resting upon the timber and connected to the post, forming a jointed pivot pawl, arranged and operated in the manner and for the purpose set forth, together with the mode of holding down the lever by a rope, as aforesaid, as substantially applied to the purposes of a pawl, by which the advantages named are gained.”

21. For an *Improvement in Straw Cutters*; Thomas and Edward Burrell, Seneca, Seneca county, New York, September 11.

Claim.—“What we claim as new, is, 1st, the employment of four feeding rollers, in the

manner described, the top hind roller having spikes on its surface, to hold firmly the straw, &c., and the combination of the said four rollers, to feed in the straw or stalks with a steady uniform motion, so that the action of the cutter wheel will not arrest the motion of the sheet of stalks, &c., when fed in to the knives, however great the speed of the cutter wheel may be.

"2d, We claim the cylinder-fluted pinion wheels, in combination with the upper face cog wheels, to allow the top rollers to rise up and slide down, when different thicknesses of stalks, &c., are fed into the cutters, this being a superior manner of gearing to accomplish this object, and avoid all breakage of cogs in the wheels, for the purposes set forth."

22. For an *Improved Machine for Polishing Knives*; Asa Munger and Royal C. Taylor, Auburn, New York, September 11.

The patentees say,—“Our invention consists in introducing the polishing substance into a hollow drum, in which it is ground, and from which it is fed between the adjoining faces of two revolving concentric disks of leather, or other flexible substance, one of which is attached solidly to a central shaft; the other is movable on the shaft, and is pressed against the first by a star-shaped spring, in such a manner that it shall close before and behind a knife inserted between the two, and prevent the polishing powder from being wasted.”

Claim.—“What we claim as our invention, is the grinding drum and sieve, and polishing surfaces, arranged on one shaft, whereby the several operations of grinding, sifting, and feeding the polishing material, and polishing the cutlery, are simultaneously performed in a simple and convenient manner.”

23. For an *Improvement in Registers for Hot Air Furnaces*; Charles F. Tuttle, Williamsburg, Kings county, New York, September 11.

The patentee says,—“The nature of my invention consists in the new and improved method of opening and closing the valves of hot air registers and ventilators, by means of a slide piece, placed either at the top or at one end of the register, the said slide piece being connected to the valves by means of connecting rods that work with a joint at their point of connexion with the slide, and also with a joint at their point of connexion to the valves, one end of the connecting rod moving in a circular direction, corresponding to the motion of the valves moved, constructed so as to seriously diminish the friction in opening.”

Claim.—“What I claim as my invention, is the combination of the slide piece and the connecting rod or rods, for the opening and closing of hot air registers and ventilators, the said connecting rod or rods being so joined to the slide piece as to form a joint at the place of connexion, the said connecting rod or rods also forming a joint at their point of connexion to the valves or arms thereof, causing the end of the rods joined to the valves to move in a circular direction, corresponding to the motion of the valves when moved.”

24. For an *Improvement in Parallaxic Instruments for Measuring Distances*; William Würdemann, City of Washington, D. C., September 11.

The patentee says,—“The principle of my invention consists in thus mounting a telescope, provided with a micrometer eye-piece, that two positions, as nearly as possible parallel to each other, may be given to it. The distance of the two positions from each other, which is invariable, furnishes the base, which being transferred, by means of the micrometer, crosswise to the object whose distance is to be measured, appears in the field of the telescope of a magnitude in an exact inverse proportion in relation to the distance.

“This magnitude being measured by means of the micrometer, the angle of parallax is thereby obtained, from which the distance may be calculated, or, more conveniently, read off from a table previously prepared for the instrument.”

Claim.—“What I claim as my invention, is mounting a telescope, furnished with a micrometer, upon an axis parallel to its line of collimation, as herein described, whereby the telescope can be made, with facility and accuracy, to take two parallel positions at the extremities of a given base line, for the purpose of measuring the distance of a remote object by means of the parallaxic angle thus obtained by the micrometer.”

25. For an *Improvement in Machines for Breaking Hides*; Isaac S. Hershey, Hagerstown, Washington county, Maryland, September 11.

Claim.—“What I claim as my invention, is the before described combination of right and left revolving helical breakers, constructed and operated substantially as set forth, for breaking or softening hides.”

To be Continued.

MECHANICS, PHYSICS, AND CHEMISTRY.

*On an Equation between the Temperature and the Maximum Elasticity of Steam and other Vapors. By WILLIAM JOHN MACQUORN RANKINE, Civil Engineer. (WITH A PLATE.)**

Continued from page 125.

TABLE II.—*Vapor of Water.*

Formula for calculating the Maximum Elasticity of Steam (P), from the Temperature on the Air Thermometer, measured from the Absolute Zero (t):

$$\text{Log. } P = a - \frac{\beta}{t} - \frac{\gamma}{t^2}$$

Inverse Formula for calculating the Temperature from the Maximum Elasticity of Steam:

$$\frac{1}{t} = \sqrt{\frac{a - \text{Log. } P}{\gamma} + \frac{\beta^2}{4\gamma^2}} - \frac{\beta}{2\gamma}$$

Values of the Constants depending on the Thermometric Scale.

For the Centigrade Scale:—

Absolute zero $274^{\circ}\cdot 6$ below the freezing point of water.

$$\text{Log. } \beta = 3\cdot 1851091$$

$$\text{Log. } \gamma = 5\cdot 0827176$$

$$\frac{\beta}{2\gamma} = 0\cdot 0063294$$

$$\frac{\beta^2}{4\gamma^2} = 0\cdot 00004006$$

For Fahrenheit's scale; boiling point adjusted at $29\cdot 922$ inches:—

Absolute zero $462^{\circ}\cdot 28$ below ordinary zero.

$$\text{Log. } \beta = 3\cdot 4403816$$

$$\text{Log. } \gamma = 5\cdot 5932626$$

$$\frac{\beta}{2\gamma} = 0\cdot 0035163$$

$$\frac{\beta^2}{4\gamma^2} = 0\cdot 000012364$$

For Fahrenheit's scale; boiling point adjusted at 30 inches.

Absolute zero $461^{\circ}\cdot 93$ below ordinary zero.

$$\text{Log. } \beta = 3\cdot 4400625$$

$$\text{Log. } \gamma = 5\cdot 5926244$$

$$\frac{\beta}{2\gamma} = 0\cdot 0035189$$

$$\frac{\beta^2}{4\gamma^2} = 0\cdot 000012383$$

Values of the Constant a , depending on the Measure of Elasticity.

For millimetres of mercury	$a = 7\cdot 831247$
English inches of mercury	6·426421
Atmospheres of 760 mil. = $29\cdot 922$ inches = 14·7 lbs. on } the square inch = 1·0333 kil. on the centimetre ² }	4·950433
Atmospheres of 30 inches = 761 mil. ·99 = 14 74 lbs. on } the square inch = 1·036 kil. on the centimetre ² }	4·949300
Kilogrammes on the square centimetre	4·964658
Pounds Avoirdupois on the square inch	6·117817

N B.—All the Constants are for common logarithms.

I have applied similar formulæ to the vapors of *alcohol* and *ether*, making use of the experiments of Dr. Ure.

In order to calculate the constants, the following experimental data have

* From the Edinburgh New Philosophical Journal, for July, 1849.

been taken, assuming that, on Dr. Ure's thermometers, 180° were equal to 100 centigrade degrees.

	Temperatures on Fahrenheit's Scale from		Pressures in Inches of Mercury.	REMARKS.
	the ordinary zero.	the absolute zero.		
For Alcohol of the specific gravity 0.813,	250.00	712.30	132.30	From Dr. Ure's Table.
	173.00	635.30	30.00	Do.
	111.02	573.32	6.30	Interpolated in the same Table.
For Ether, boiling at 105° F., under 30 in. pressure,	200.00	662.30	142.80	From Dr. Ure's Table.
	148.80	611.10	66.24	Interpolated.
	105.00	567.30	30.00	From the Table.
For Ether, boiling at 104° F., under 30 inches,	104.00	566.30	30.00	From Dr. Ure's Table.
	66.70	529.00	13.76	Interpolated.
	34.00	496.30	6.20	From the Table.

The values of the constants in equation (1.), calculated from these data, are as follows, for inches of mercury and Fahrenheit's scale:—

	α	Log. β .	Log. γ .
Alcohol, specific gravity, 0.813, . . .	6.16620	3.3165220	5.7602709
Ether, boiling point, 105° F. . . .	5.33590	3.2084573	5.5119893
Ether, boiling point, 104° F. . . .	5.44580	3.2571312	5.3962460

Absolute zero $462^{\circ}.3$ below ordinary zero.

The curves represented by the formulæ for those three fluids are laid down on the diagram which accompanies this memoir (Plate 2), and which, in the engraving, has been reduced to one-fourth of the original scale. The horizontal divisions represent the scale of Fahrenheit's thermometer, numbered from the ordinary zero;—the vertical divisions, pressures of vapor, according to the scales specified on the respective curves. The points corresponding to the experimental data are surrounded by small circles.

The curve for alcohol extends from 32° to 264° of Fahrenheit. It is divided into two portions, having different vertical scales, suitable to high and low pressures respectively.

The curve for the less volatile ether extends from 105° to 210° ; that for the more volatile ether, from 34° to 104° .

The results of Dr. Ure's experiments are marked by small crosses.

The irregular and sinuous manner in which these crosses are distributed, indicates that the errors of observation, especially at high temperatures, must have been considerable. This does not appear surprising, when we recollect how many causes of uncertainty affect all the measurements required in such experiments, especially the thermometric observations, and how little those causes have been understood until very recently. The

data from which these constants have been calculated, are, of course, affected by the general uncertainty of the experiments.

When those circumstances are taken into account, it is obvious from inspection of the diagram, that the curves representing the formulæ agree with the points representing the experiments, as nearly as the irregularity of the latter and the uncertainty of the data permit; and that there is good reason to anticipate, that, when experiments shall have been made on the vapors of alcohol and ether with a degree of precision equal to that attained by M. Regnault in the case of the vapor of water, the equation will be found to give the elasticities of those two vapors as accurately as it does that of steam.

Although the diagram affords the best means of judging of the agreement between calculation and experiment, three Tables (III., IV., and V.) are annexed, in order to shew the numerical amount of the discrepancies at certain temperatures. The data, as before, are marked with asterisks.

It is worthy of remark, in the case of alcohol, that although the lowest of the experimental data is at the temperature of $111^{\circ}02$, the formula agrees extremely well with the experiments throughout the entire range of 79° below that point.

TABLE III.—Vapor of Alcohol, of the Specific Gravity 0.813.

Temperature in Degrees of Fahrenheit from the ordinary zero.	Pressures in Inches of Mercury according to		Differences be- tween Calcula- tion and Experi- ment in inches.	Corresponding Differences of Temperature.
	The Formula.	Dr. Ure's Experiments.		
32.00	0.41	0.40	+ 0.01	— 0.5
40.00	0.57	0.56	+ 0.01	— 0.4
50.00	0.84	0.86	— 0.02	+ 0.7
60.00	1.22	1.23	— 0.01	+ 0.2
70.00	1.74	1.76	— 0.02	+ 0.3
80.00	2.43	2.45	— 0.02	+ 0.2
90.00	3.36	3.40	— 0.04	+ 0.4
100.00	4.56	4.50	+ 0.06	— 0.5
110.00	6.12	6.00	+ 0.12	— 0.7
* 111.02	6.30	6.30	0.00	0.0
120.00	8.10	8.10	0.00	0.0
130.00	10.61	10.60	+ 0.01	— 0.0
140.00	13.73	13.90	— 0.17	+ 0.5
150.00	17.60	18.00	— 0.40	+ 0.9
160.00	22.32	22.60	— 0.28	+ 0.5
170.00	28.06	28.30	— 0.24	+ 0.4
* 173.00	30.00	30.00	0.00	0.0
180.00	34.96	34.73	+ 0.23	— 0.3
190.00	43.21	43.20	+ 0.01	— 0.0
200.00	52.96	53.00	— 0.04	+ 0.0
210.00	64.47	65.00	— 0.53	+ 0.5
220.00	77.92	78.50	— 0.58	+ 0.4
230.00	93.54	94.10	— 0.56	+ 0.4
240.00	111.58	111.24	+ 0.34	— 0.2
* 250.00	132.30	132.30	0.00	0.0
260.00	155.98	155.20	+ 0.78	— 0.3
264.00	165.58	166.10	— 0.52	+ 0.2
[1.]	[2.]	[3.]	[4.]	[5.]

TABLE IV.—Vapor of Ether—Boiling Point 105° F.

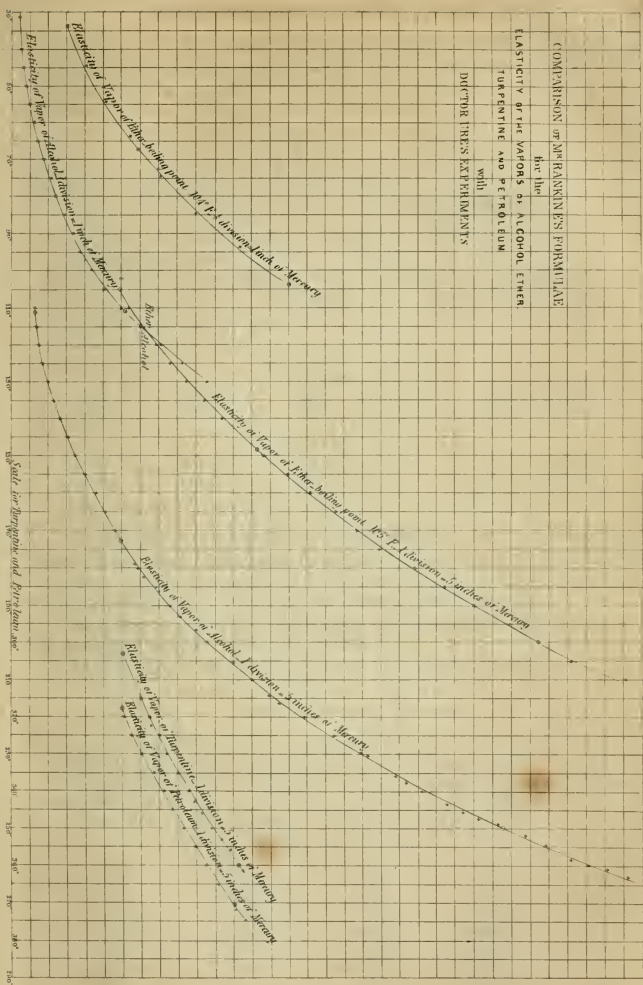
Temperature in Degrees of Fahrenheit above the ordinary zero.	Pressures in Inches of Mercury according to		Differences between Calculation and Experiment in inches of Mercury.	Corresponding Differences of Temperature.
	The Formula.	Dr. Ure's Experiments.		
*105·0	30·00	30·00	0·00	0·0
110·0	33·08	32·54	+ 0·54	— 0·9
120·0	39·98	39·47	+ 0·51	— 0·7
125·0	43·83	43·24	+ 0·59	— 0·8
130·0	47·95	47·14	+ 0·81	— 1·0
140·0	57·10	56·90	+ 0·20	— 0·2
*148·8	66·24	66·24	0·00	0·0
150·0	67·53	67·60	— 0·07	+ 0·1
160·0	79·35	80·30	— 0·95	+ 0·9
170·0	92·68	92·80	— 0·12	+ 0·1
175·0	99·94	99·10	+ 0·84	— 0·6
180·0	107·62	108·30	— 0·68	+ 0·4
190·0	124·29	124·80	— 0·51	+ 0·3
*200·0	142·80	142·80	0·00	0·0
205·0	152·78	151·30	+ 1·48	— 0·7
210·0	163·27	166·00	— 2·73	+ 1·1
[1.]	[2.]	[3.]	[4.]	[5.]

TABLE V.—Vapor of Ether—Boiling Point 104° F.

Temperature in Degrees of Fahrenheit above the ordinary zero.	Pressures in Inches of Mercury according to		Differences between Calculation and Experiment in inches of Mercury.	Corresponding Differences of Temperature.
	The Formula.	Dr. Ure's Experiments.		
*34·0	6·20	6·20	0·00	0·0
44·0	8·02	8·10	— 0·08	+ 0·4
54·0	10·24	10·30	— 0·06	+ 0·2
64·0	12·94	13·00	— 0·06	+ 0·2
*66·7	13·76	13·76	0·00	0·0
74·0	16·19	16·10	+ 0·09	— 0·2
84·0	20·06	20·00	+ 0·06	— 0·1
94·0	24·64	24·70	— 0·06	+ 0·1
*104·0	30·00	30·00	0·00	0·0
[1.]	[2.]	[3.]	[4.]	[5.]

The results of Dr. Ure's experiments on the vapors of *turpentine* and *petroleum* are so irregular, (as the diagram shews,) and the range of temperatures and pressures through which they extend so limited, that the value of the constant γ cannot be determined from them with precision. I have, therefore, endeavored to represent the elasticities of those two va-

COMPARISON OF MR RANKINE'S FORMULAE
for the
ELASTICITY OF THE VAPORS OF ALCOHOL ETHER,
TURPENTINE AND PETROLEUM
with
DOCTOR TREES EXPERIMENTS



Degrees of Fahrenheit's Thermometer Scale for Alcohol and Ether.



pors approximately by the *first two terms* of the formula only, calculating the constants from two experimental data for each fluid. The equation thus obtained

$$\text{Log. } P = a - \frac{\beta}{t}$$

is similar in form to that of Professor Roche.

The data, and the values of the constants, are as follows:—

Temperatures on Fahrenheit's Scale from		Pressures in Inches of Mercury.	Values of the Constants for Fahrenheit's Scale and Inches of Mercury.
the ordinary zero.	the absolute zero.		
360°	822°·3	<i>Turpentine.</i> 60·80	$a = 5\cdot9818700$
304	766°·3	30·00	$\text{Log. } \beta = 3\cdot5380701$
370	832°·3	<i>Petroleum.</i> 60·70	$a = 6\cdot1945100$
316	778°·3	30·00	$\text{Log. } \beta = 3\cdot5648490$

Although the temperatures are much higher than the boiling point of water, I have not endeavored to reduce them to the scale of the air thermometer, as it is impossible to do so correctly, without knowing the nature of the glass of which the mercurial thermometer was made.

The diagram shews that the formula agrees with the experiments as well as their regularity entitles us to expect.

The following Tables give some of the numerical results.

TABLE VI.—*Vapor of Turpentine.*

Temperatures in Degrees of Fahrenheit from the ordinary zero.	Pressures in Inches of Mercury according to		Differences between Calculation and Experiment in inches of Mercury.	Corresponding Differences of Temperature.
	The Formula (of two terms.)	Dr. Ure's Experiments.		
*301°	30·00	30·00	0·00	0°·0
310	32·52	33·50	— 0·98	+ 2·3
320	37·09	37·06	+ 0·03	— 0·0
330	42·16	42·10	+ 0·06	— 0·1
340	47·78	47·30	+ 0·48	— 0·9
350	53·98	53·80	+ 0·18	— 0·3
*360	60·80	60·80	0·00	0·0
362	62·24	62·40	— 0·16	+ 0·0
[1.]	[2.]	[3.]	[4.]	[5.]

TABLE VII.—Vapor of Petroleum.

Temperatures in Degrees of Fahrenheit, from the ordinary zero.	Pressures in Inches of Mercury according to		Differences between Calculation and Experiment in Inches of Mercury.	Corresponding Differences of Temperature.
	The Formula (of two terms.)	Dr. Ure's Experiments.		
*316°	30.00	30.00	0.00	0.0°
320	31.71	31.70	+ 0.01	— 0.0
330	36.35	36.40	— 0.05	+ 0.1
340	41.52	41.60	— 0.08	+ 0.2
350	47.27	46.86	+ 0.41	— 0.7
360	53.65	53.30	+ 0.35	— 0.5
*370	60.70	60.70	0.00	0.0
375	64.50	64.00	+ 0.50	— 0.7
[1.]	[2.]	[3.]	[4.]	[5.]

I have also endeavored, by means of the first two terms of the formula, to approximate to the elasticity of the vapor of *mercury* as given by the experiments of M. Regnault. The data and the constants are as follows:

Temperatures in Centigrade Degrees from		Pressures in Millimetres of Mercury.	Value of the Constants in the Formula $\text{Log. } P = a - \frac{\beta}{t}$
the freezing point.	the absolute zero.		
358°0	632°6	760.00	a for millimetres = 7.5305000
177.9	452.5	10.72	" for English inches 6.1259000
			Log. β Centigrade scale, 3.4685511
			" Fahrenheit's scale, boiling point adjusted at 3.7238236
			29.922 inches, }

The following table exhibits the comparative results of observation and experiment.

TABLE VIII.—Vapor of Mercury.

Temperatures in Centigrade Degrees from the Freezing Point.	Pressures in Millimetres of Mercury according to		Differences between Calculation and Experiment in Millimetres.
	The Formula (of two terms.)	M. Regnault's Experiments.	
72°74	0.115	0.183	— 0.068
100.11	0.480	0.407	+ 0.073
100.60	0.490	0.560	— 0.070
146.30	3.490	3.460	+ 0.030
*177.90	10.720	10.720	0.000
200.50	21.850	22.010	— 0.160
*358.00	760.000	760.000	0.000

The discrepancies are obviously of the order of errors of observation, and the formula may be considered correct for all temperatures below 200° C., and for a short range above that point. From its wanting the third term, however, it will probably be found to deviate slightly from the truth between 200° and 358°; while above the latter point it must not be relied on.

I have not carried the comparison below 72°, because in that part of the scale the whole pressure becomes of the order of errors of observation.

In conclusion, it appears to me that the following proposition, to which I have been led by the theoretical researches referred to at the commencement of this paper, is borne out by all the experiments I have quoted, especially by those of greatest accuracy, and may be safely and usefully applied to practice.

If the maximum elasticity of any vapor in contact with its liquid be ascertained for three points on the scale of the air thermometer, then the constants of an equation of the form

$$\text{Log. } P = a - \frac{\beta}{t} - \frac{\gamma}{t^2}$$

may be determined, which equation will give, for that vapor, with an accuracy limited only by the errors of observation, the relation between the temperature (t), measured from the absolute zero (274.6 centigrade degrees below the freezing point of water), and the maximum elasticity (P), at all temperatures between those three points, and for a considerable range beyond them.

Lecture on the Sciences as Applicable to Domestic Life, delivered at a meeting of the members and friends of the Retford Literary and Scientific Institution. By GEORGE CHAPMAN, ESQ.*

In these days of education and of the march of intellect, we commonly teach our children every art, every science, and every accomplishment that the mind of man can suggest; but we too often forget to teach them that which would turn all these to good effect, viz., to think, to reason, and to observe. "A mind which has once imbibed a taste for scientific inquiry," says Sir John Herschell, "and has learnt the habit of applying its principles readily to the cases which occur, has within itself an inexhaustible source of pure and exciting contemplations." One would think that Shakspeare had such a mind in view when he describes a contemplative man as finding

"Tongues in trees, books in the running streams,
Sermons in stones, and good in every thing."

Accustomed to trace the operations of general causes, and the exemplification of general laws, in circumstances when the uninformed and unenlightened eye perceives neither novelty nor beauty, he walks in the midst of wonders, every object which falls in his way elucidates some principle, affords some instruction, and impresses him with a sense of harmony and

* From the London Farmer's Magazine, for January, 1850.

order. Nor is it a mere passive pleasure which is thus communicated. A thousand subjects of inquiry are continually arising in his mind, which keep his faculties in constant exercise and his thoughts perpetually on the wing; so that lassitude is excluded from his life, and that craving after artificial excitement and dissipation of mind, which leads so many into frivolous, unworthy, and destructive pursuits, is altogether eradicated from his bosom.

Desiring at the same time to instruct the youthful and refresh the memory of the better informed portion of my hearers, I will not apologize for sometimes descending to what might otherwise be deemed examples too familiar to require explanation. Imagining myself, then, your companion from first awakening in the morning till the evening calls you again to repose, I will endeavor to explain the cause of the various phenomena that will fall under your notice.

We will therefore commence with the first object that presents itself to our view on awakening on a fine frosty morning. The window of our bed-room is probably covered with hoar frost, whilst that of the adjoining or dressing-room, though the aspect is quite as cold, remains perfectly clean. Now what is the cause of this phenomena? In the bed-room the vapor, arising from the breath of its inhabitants, has created a damp atmosphere, which, when it arrives at the window, becomes condensed upon the cold glass, in the same manner as we have observed on cold water jugs or other glasses when brought into a warm room. This condensed vapor, from the severity of the external atmosphere, is formed into ice in the most minute particles, and has caused those brilliant coruscations, in every variety of form and shape, which the process of crystallization has produced. The adjoining room having been destitute of an inhabitant, has had nothing to produce a damp atmosphere; and, therefore, though the temperature was the same, there is no appearance of frost on the windows. In frosty weather it is a common remark made to domestics to be careful in cleaning the windows, as the glass is brittle; and this certainly is the case, and for an obvious reason. The outside of the window is exposed to a cold frosty air, whilst the inside is warmed by the heated air of the room; hence, the two sides are expanded in different ratios, and a slight accident is sufficient to break the pane, just as hot water put suddenly into a cold glass may crack the vessel, especially if it be so thick that the heat is not readily transmitted through it.

Another curious circumstance may arrest attention on rising from bed, and that is the difference found on putting the feet upon a carpet or on a marble hearth; the cold of the first being scarcely perceptible, whilst the latter has a more chilling effect; and yet, if both were examined by the thermometer, they would be found of the same temperature. To explain this, it will be necessary to remember the fact, that bodies of different temperature, when brought into contact, assimilate the same heat—the one becoming colder as the other becomes warmer. Some substances are much quicker in imbibing and imparting warmth than others, and are therefore termed good or bad conductors of heat. In the instance just mentioned, the carpet is a bad conductor, consequently, when the warm foot is placed upon it, it does not suffer much loss of heat. On the contrary, marble is a very good conductor; the moment, therefore, the foot is placed upon it,

the marble absorbs a portion of the warmth, and having an easy mode of disposing of it, immediately calls upon the foot for a fresh supply. In the same way we account for the cold felt on immersing the hand in a basin of water, though the water is probably warmer than the air; but the superior conducting power of water renders us far more susceptible to the cold when conveyed by water than by air.

That color also exercises considerable influence in the absorption of caloric, may be shown by the following experiment:—When the ground is covered with snow, take four pieces of woolen cloth—black, blue, brown, and white—and lay them on the snow exposed to the sun; in a few hours the black cloth will have sunk considerably below the surface, the blue nearly as much, the brown considerably less, whilst the white will remain in precisely its former position on the surface of the snow. It thus appears that the sun's rays are absorbed by the dark colored, and excite such a degree of heat as to melt the snow beneath, but that they have little power to penetrate the white cloth. It is from this cause we observe that a white surface, such as the tombstones in a church-yard, will remain covered with hoar frost long after it has melted from the darker-colored foot-paths.

I will next draw attention to the pernicious practice of sleeping with the curtains drawn close around our beds, which would scarcely be persisted in did we but reflect on the effect produced by thus depriving ourselves of pure air during the hours of sleep. Air that has been once breathed is rendered unfit for animal life until it has again been purified; it is composed of two gases, termed oxygen and hydrogen: the first of these is the great agent in respiration and combustion; the latter is of a contrary nature, and is fatal to animal life. Yet on the proper mixture of these two gases the purity of our atmosphere depends. In the process of respiration the air is deprived of a large portion of its oxygen, and obtains in its stead a portion of carbonic acid gas, which also, like hydrogen, is not capable of supporting life. It therefore now follows that air, after it has served the purposes of respiration, is no longer fit for man till it has been purified in nature's best laboratory, where that portion which was unfit for animal life is absorbed by the vegetable world, and the other substances by which it is brought into contact, and from them it again absorbs its proper proportion of oxygen gas. The air, as it passes through the lungs, is brought into very close contact with the blood as it returns from its circuit round the system: it is then in a dark colored state, and unfit to be again circulated. From this close connexion with the atmospheric air, it speedily obtains a large supply of oxygen, which turns it to a beautiful bright red, and it is again fit to be expelled by the action of the heart to the extremities; the blood by this means has become pure, but the breath at the same time has become vitiated, being deprived of its vital quality, and having imbibed carbonic acid in its stead. It therefore follows, that the more we are exposed to the free air of heaven the better will be the state of our blood. Of the pure air, a man requires about a gallon per minute; so that if the curtains of a bed are closely drawn, we may easily imagine how prejudicial such an atmosphere must be. There is positively less risk of infection in attending the fever wards of an hospital, where the beds are without testers or drapery of any kind, than in the more luxurious bed-rooms of the middle and higher classes of society, where frequently the excess of

anxiety and fear that a too cold air should visit the patient induces the tender nurse to draw close the curtains, and thus exclude the first of medicines—a pure atmosphere.

[Mr. Chapman here quoted a passage from “Waterton’s Essays on Natural History,” showing the folly of excluding night-air from our dwellings, and proceeded:]

In performing our morning ablutions, we shall be led to remark the difference between hard and soft water, and their different action upon soap. Hard or spring water has, by filtering through the earth for a considerable time, imbibed many impurities from the various earthy and mineral substances with which it has come in contact. “There is a very curious fact,” says Professor Griffiths, “presented during the formation of lime-water, namely, that the colder the water the more lime will it actually dissolve: thus, water at 33° , or near the freezing point, will dissolve exactly twice as much lime as water will do at 212° , or its ordinary boiling point.”

These impurities have the effect of decomposing the soap, and preventing its solution by the water, on which the washing properties of the soap depend. Rain water, before coming in contact with these soluble substances, is pure—being, in fact, condensed vapor or steam. White soap dissolved in strong spirits of wine, so as to form a clear transparent liquid, is a simple and accurate test of the relative purity of water. Soap is perfectly soluble in pure or distilled water,—hence no curdling ensues when added to it; on the other hand, if the water contains sulphate of lime, (upon which its hardness generally depends,) the soap is immediately decomposed: it is a compound of soda and fatty or oily matter, and the lime combines with such matter, forming an insoluble soap, or curd.

Whilst speaking of the properties of hard and soft water in dissolving soap, we are forcibly reminded of our early days, and the hours we have spent in blowing soap bubbles, watching the beautiful colors they assume, till, just as they appear to have attained the height of perfection, they suddenly vanish, and disappoint all our hopes; like many an airy day dream which, since that time, has filled our imagination, and has as suddenly disappeared. A bubble is nothing more than a very thin film distended with air. When blown from a tobacco-pipe we see it ascend, the warm breath with which it is filled being lighter than the external cold air, the difference being more than the weight of the light film forming the bubble; in a very few seconds, however, if they do not previously burst, these miniature balloons fall, the air contained in them condensing as they cool, when the weight of the film brings them to the ground. This, however, is but a small portion of the wonders of the soap bubble, which will be heightened in our estimation when we find that, in his observations upon it, the great Newton was assisted in some of the most astonishing discoveries in optics that have ever been made. The changing colors of the soap bubble caught his attention, but how to account for it was the difficulty which he has solved in his theory of light. It is, however, far too deep a subject for present consideration. I will, therefore, merely explain that white light, as we may term it, consists of three primary colors, red, blue, and yellow, but which, when blended together, make white. That the mixture of red, blue, and yellow produces white, may easily be shown by dividing a circular card into three equal parts, coming to a point in the centre, and

painting the one part blue, the next red, and the next yellow; if a pin be put through the centre, and the card rapidly turned round on it, it will appear white. Now light, on passing through a medium, such as glass or water, under certain circumstances, becomes refracted or bent; and, according to the different degrees to which the ray is bent, it assumes different colors on emerging, by refraction, from the medium through which it has passed. The various colors of the soap bubble, therefore, depend on the slackness of the film through which the ray passes, because different thicknesses will give a different angle of refraction or bending, and a bubble is constantly growing thinner till it bursts. Thus the various hues it presents are accounted for.

Having entered the breakfast-room, let us examine the phenomena which present themselves most worthy of observation. The first striking object will be the kettle boiling, and steam rising from the spout. Here we have a familiar illustration of the process of evaporation, which, when carried on by nature in her vast laboratory, is the cause of rain and fair weather, the sunshine and the storm. In the instance before us, the fire is acting the part of the sun; and on the principle already mentioned, when two bodies of different temperatures come in contact, (the one imparts and the other imbibes,) the fire imparts a portion of its heat to the water, which rises in temperature till it arrives at the boiling point, when it changes its character, and, from an almost incompressible fluid, becomes that highly elastic vapor, steam, whose giant arm is so wonderfully employed in chasing the face of the universe, and connecting the remotest corners of the globe by its expansive power. But perhaps it will be requisite, before proceeding further, to say a few words on heat, or caloric, as it is more scientifically termed. Caloric, then, may be familiarly defined as an extremely subtle quality residing in every substance; and although it cannot be termed material, it has the property of insinuating itself between the pores of substances, and causing them to repel one another and fly asunder, increase of temperature being almost invariably attended with increase of bulk.

In the instance of the kettle, the water has absorbed caloric from the fire, which, mingling with its particles, has caused them to repel one another, till they have overcome the density of the fluid, and it flies off in the shape of steam. This vapor diffuses itself over the room till it meets with some cold surface, which condenses it into its original state of water. In a room where there is a large party, and, consequently, a considerable quantity of water, so that, from the warmth of the room, it may be invisible, we shall observe, on cold glasses being introduced, that they are immediately covered with steam. It is from a circumstance exactly resembling this that southerly winds are often accompanied with rain. The regions over which a southerly wind has passed, in coming to us, are generally warmer than the part we inhabit; the wind, therefore, is warmer. Now we know that warm air will retain a larger portion of vapor than cold air will, because, when the cold tumbler was brought into the room, the water contained in solution in the air was immediately deposited on the glass; in like manner, the warm south wind, when it arrives in our colder climate, is obliged to abandon a portion of the vapor it held in solution, which consequently falls in the shape of rain.

It, at first, appears extraordinary that steam, which is, as we have just

seen, only water in a different form, should be so light as to rise in air; yet such is the case, the repulsive power of heat having separated the particles to such an extent that it has become even lighter than air: that is to say, a pound of water converted into steam occupies more space than a pound of air would do; it is, therefore, specifically lighter, and floats in the air, till the coldness of the atmosphere into which it ascends, by robbing it of its caloric, reduces it to a dense fluid, when it descends in air almost imperceptible, as dew or rain.

The current of air and smoke which ascends the chimney is again an object to attract our attention, caused by the same expansive power of heat. The air, as it passes through and over the fire, becomes greatly increased in bulk, and consequently lighter, causing it to ascend through the denser part, leaving its space to be filled by cold air from the door or window. By this means the fire is supplied with the proportion necessary for combustion, whilst a considerable quantity of rarified air ascends the chimney, carrying up with it the smoke or dense vapor which arises from burning bodies. It may be inquired how it is, when a fire is lighted in a room, the air does not descend the chimney to supply it, because that appears the easiest access to the outside air; and this, if the chimney were very large, and quite open above, so as to admit space enough for an ascending and descending current, might be the case. To obviate this, we contract the opening at top by putting on a chimney pot, by which means the current of ascending air is rendered so strong through the small aperture as to prevent the external air from entering.

Sudden gusts of wind are apt to cause chimnies to smoke, by removing the equality of the atmospheric pressure on the outside. During the gust the perpendicular pressure is partly removed by the velocity with which it passes over; the consequence is that, during the time of the gust, whilst the pressure is removed, there is a rapid draft up the chimney, caused by the want of resistance above; but the moment the wind lulls again, this pressure returns, the upward draft is suddenly checked, which causes a momentary obstacle to the ascending current, and a puff of smoke in the room is the probable result. Some particular direction of wind will generally influence a chimney in this way more than another, either from some peculiarity in the situation above, or from the apartment being more or less immediately influenced by the same cause; for it is clear, if the variation of pressure above and in the room is simultaneous no confusion will take place; but if one happens a few seconds after the other a contrary effect will be produced.

In warm weather we often find a disagreeable smell of soot in our rooms, the reason of which is that, in the day time, whilst the outward air is very warm, the chimney, not having been in use, and being removed from the sun, is considerably colder; it consequently cools the air and condenses it, causing it to descend into the room. In the night, when the air in the room is warmer than the external air, it expands and rises in the chimney.

It is this same principle which influences the land and sea breezes of tropical climates; the surface of the shore becoming very much heated by the perpendicular rays of the sun, the air above it is warmed, causing it to ascend, and the space left is filled by fresh air from the sea; for the sun's rays having penetrated deeper into the water, the surface has not become

so hot, and the air above is comparatively cool. In the night, when the surface of the earth becomes cool, the air above it condenses and descends, whilst the air above the water has become the warmest, because the water is giving out the heat which it had imbibed during the day; the wind will therefore blow from the land to the sea.

By taking a glance over the breakfast table, we shall be reminded that a bright silver tea pot will make better tea than an earthenware one, and for this simple reason—that bright surfaces radiate or throw off heat much slower than black or dull ones, consequently the tea is kept better. From this we may learn, that whenever heat is to be retained a bright vessel should be employed; but, on the contrary, if we want a vessel to absorb heat rapidly, a black surface is the best. The quickest boiling saucepan, therefore, will be the one which is black on that part exposed to the fire, but bright on the portion which comes only in contact with the air; the black part acting as a good conductor, to allow the heat to approach the water—the bright as a bad radiator to prevent its escape. Woolen, as before stated, in the instance of the carpet, is a bad conductor, therefore a very proper substance to wrap round anything which is to be kept hot; and, by the same reasoning, although it may sound rather contradictory, it will equally keep any substance cold; for instance, a piece of ice wrapped in woolen will be much slower melting than another piece not so enveloped. Heat and cold, we must remember, are only relative terms, as there is no precise point where heat ends and cold begins.

Before leaving the breakfast room, we will just observe the effect of a lump of sugar put into a cup of tea; we shall find it will be some time melting if left at the bottom of the cup, but if we hold it in a spoon at the surface it will dissolve very speedily. This arises from the sugar, as it melts, rendering the tea heavier; the sweetened portion therefore descends, leaving the sugar constantly in contact with a fresh portion of unsweetened tea, keeping up a continual circulation till it is all dissolved; whereas, when the sugar is at the bottom of the cup, it remains in the sweet portion of the liquid, which, becoming saturated, causes it to dissolve the sugar, and it requires stirring to bring it in contact with the unsweetened portion of the tea. This may be prettily shown if we color a lump of sugar with a little ink, and put it at the bottom of a deep glass, gently filling it with water, then color another lump, and hold it at the surface of another similar glass; the one will be dissolved away quickly, while the other will remain at the bottom of the glass.

To be continued.

*On the Production of Lightning by Rain. By WILLIAM RADCLIFF BIRT.**

On the 26th of July, 1849, a severe thunder-storm, accompanied by the destruction of property and the loss of human life, passed over the metropolis. About 1h. 30m. P. M., the clouds towards the north-east presented a very dark and threatening aspect; they assumed an inky color, and the velocity of their motion was very slow; in fact, the appearance noticed was strikingly of that character which the writer has frequently

* From the London, Edinburgh, and Dublin Philosophical Magazine, for September, 1849.

observed to precede a thunder-storm. On this occasion his attention was more particularly directed to the connexion between the electric discharge and the sudden gush of rain that more or less accompanies it, with a view to illustrate the question occurring in the Report of the Committee of Physics, approved by the President and Council of the Royal Society, p. 46, "Is this rain a *cause* or *consequence* of the electric discharge?" *

On the previous day, the 25th, about 3h. 50m. P. M., during a thunder-storm a sudden gush of heavy rain occurred, which, within two seconds, by estimation, was *succeeded* by a vivid flash of lightning: the thunder occurred at a further interval of some few seconds. From this it would appear, provided the heavy rain fell over the entire space between the place of observation and that of the electric discharge, that it was not a *consequence* of that discharge, the gush occurring at a sensible interval previous thereto.

The setting in of the storm of the 26th, about 1h. 45m. P. M., again called the attention of the writer to this point; and several flashes occurred between 1h. 45m. P. M. and 2h. 3m. P. M., without being preceded by a gush, although heavy rain more or less accompanied the discharges, in one or two instances almost simultaneously or immediately afterwards. At length, about 2h. 4m. P. M., a most violent and very remarkable gush of rain occurred, which was followed within one minute by a most vivid flash of lightning, the thunder succeeding almost instantaneously. The windows of the house in which the writer was observing the storm were sensibly shaken, and portions of the mortar between the arches over the windows and the frames thrust out, of course by concussion. Within a minute or two after this discharge a partial cessation of the heavy rain took place, but sudden gushes occurred at short intervals within the next six or seven minutes; they were, however, unaccompanied by lightning.

At the end of this period the atmosphere presented a very remarkable appearance; a perfect stillness characterized the air, which possessed great transparency, so that the surrounding objects were seen with very minute distinctness of detail. The stillness and transparency during the time they continued, riveted the observer to their contemplation. It appeared that during this time the storm was hushed, and a calm of a rather extraordinary character succeeded it, during which a rather large break in the clouds was seen towards the south-east, and the entire phenomena at this time induced the idea that the weather was clearing up. Within ten minutes, however, the storm again burst forth; the lightnings played, the thunder roared, and heavy rain, mingled with hail so thickly that comparatively near objects could scarcely be distinguished, fell in torrents, and the writer

* The paragraph runs thus:—"There is one point to which we wish that some attention might be paid,—it is the sudden gush of rain which is almost sure to succeed a violent detonation immediately overhead. Is this rain a *cause* or *consequence* of the electric discharge? Opinion would seem to lean to the latter side, or rather, we are not aware that the former has been maintained or even suggested. Yet it is very defensible. In the sudden agglomeration of many minute and feebly electrified globules into one rain-drop, the quantity of electricity is increased in a greater proportion than the surface over which (according to the laws of electric distribution) it is spread. Its tension, therefore, is increased, and may attain the point when it is capable of separating from the *drop* to seek the surface of the *cloud*, or of the newly-formed descending body of rain, which, under such circumstances, and with respect to electricity of such a tension, may be regarded as a conducting medium. Arrived at this surface, the tension, for the same reason, becomes enormous, and a flash escapes."

observed, during the remainder of the storm, four or five sudden gushes that were quickly *succeeded* by lightning.

On all these occasions, he is quite certain that the sudden gush of rain *preceded* the electric discharge. Of all the discharges, which were very frequent, that at or near 2h. 5m. P. M. appeared to the writer to be *nearest* his own locality; the lightning appeared to him to be quite as, if not more, vivid than that at any other discharge; and the interval between it and the thunder was certainly the shortest, the thunder being the loudest.

Between 2h. 0m. P. M. and 2h. 15m. P. M., according to the concurrent testimony of several witnesses, and preceding the precipitation of the hail nearly half an hour, a discharge struck half-a-dozen houses, being Nos. 17 to 22 in West street, North street, Whitechapel, between one-fourth and one-third of a mile south of the writer's residence. The stroke appears to have presented some phenomena of an interesting and remarkable character.

Immediately behind and to the west of the houses in question is situated a large open space of ground, known as a Jews' burying-ground, in which is a piece of water not far from the houses. The gable end of No. 22 faces the west, the fronts of the houses the north, and their backs the south; the flues of No. 22 form part of the wall at the gable end. At the front and between every alternate house is a metallic spout, for the purpose of carrying off the water from the roof; the water is received from the tiles in a leaden or zinc gutter, which is in metallic communication with the spout; but it does not appear that there is a metallic communication between the gutters from house to house: these metallic spouts are short, not in any case descending so low as the doors; they are replaced by wooden spouts, which convey the water to the street.

It appears that the stroke perforated one of the chimney-pots of No. 22, descending the flue to the roof, which is stripped of a great portion of the tiles,* and then passed to the metallic spout in front, disrupting and tearing away the lower wooden spout, a piece of which, seven feet in length, it rent off and hurled with great violence into the back yard of one of the opposite houses which abutted on the north side of West street; a great portion of the piece rent from the spout, was shivered into small splinters about two inches long. A portion of the stream appears to have been conducted by the gutter communicating with the metallic spout of No. 22 to that between Nos. 20 and 21, down which it proceeded, thrusting the lower wooden spout about three or four inches from the wall, and chipping away portions of the brickwork in its passage through the front wall of No. 21, which it perforated, (the aperture being of a considerable size,) and immediately passed to the principal wheel of a silk-winding machine. A woman who was attending the machine, and had in her hand at the moment a spindle, received a severe shock, and was hurled by the force across the room.

This stream appears to have given off a lateral stroke, which manifested its effects at the box of the lock of the street door, tearing away the plastering and paper as it passed into the front room, in which a pane of glass was shattered. A woman who was near this room at the time, described

* The western wall of this house has been so shaken by the stroke, that it is considered necessary that it should be taken down and rebuilt.

the passage as being filled with a light of a blue color, and saw the lightning pass out of the back window over her child's head.

It would appear that, at the time the lightning was passing from one metallic conductor to another, in the immediate front of the houses, a young man, named Thomas Johnson, opened the street door of No. 17; he was accompanied by a lad of about 14 years of age, who was, almost immediately after the door was opened, thrown backwards. The shock was so sudden that he knew not what happened to Johnson, who was found shortly after lying on his side, his back to the wall and his feet just beyond the threshold of the door quite dead. He was evidently struck by the lightning, which, playing in the front of the houses, was probably attracted by the metallic spout that terminated a few feet above the door. The plaster just above the door, and which was most probably over his head, was torn away, but there is no mark or perforation to trace its entrance from above; the probability appears to be, that a stream struck upwards immediately after striking him. The two houses immediately opposite to Nos. 21 and 22 also received some injury from the lightning glancing sideways, as it were, from the principal stream which shattered the roof of No. 22.

It cannot fail to be remarked that the principal mischief, after No. 22 was struck, occurred in the front, and more or less in the neighborhood of the metallic spouts, which answered the purpose of *imperfect* conductors, the metallic continuity being *interrupted* on the roofs by the leaden gutters extending only a certain distance on each side of the metallic spouts, and also in front of the houses by the wooden spouts carrying the water to the earth. In connexion with the presence of the lightning in the front, the altitude of the houses struck renders it rather improbable that the stroke descended *immediately* from the cloud. The houses in West street are the *lowest* in the neighborhood; those in the street immediately to the north are rather higher; and at the further end of the street, near No. 1, are three houses in North street considerably *higher*; so that, had the stroke descended immediately from the cloud above, which it is to be presumed was at the usual elevation of clouds under these circumstances, the probability is, that the *high* houses in North street would have been struck rather than the *low* houses at the further end of West street. Should it have been the case that the stroke emanated from an altitude but little above the houses struck, we have evidently to seek the cause of the discharge *below the cloud*.

It is extremely difficult to connect the stroke with the discharge at 2h. 5m. P. M., although the concurrent testimony of the witnesses would lead to the high probability that such was the case, especially as one stated that it occurred some considerable time previous to the hail that fell. The general impression in the neighborhood appears to have been, that the lightning shot or glanced over the houses to the north of West street, when it struck the corner, and did not descend perpendicularly from a considerable height. The discharge at 2h. 5m. P. M. was, as we have already observed, *preceded* by a gush of heavy rain; and taking the suggestion in the report alluded to above into consideration, there appears to be great probability that the formation of the lightning was in accordance therewith. For upwards of half an hour violent meteorological action had taken place, the precipitation of rain being very prominent. There can be no question

that this precipitation was accompanied by well-marked electrical phenomena; and when, as at 2h. 5m. P. M., an increased and sudden precipitation occurred, it is likely that an agglomeration of the smaller drops took place, increasing, as suggested, the electric tension to such an enormous extent, that a flash escaped *in the immediate neighborhood of the houses struck*; and when we consider that, at the time, several millions of drops must have been falling, each contributing its quota to the general result, it is not to be wondered at that the tension of the electricity was so great as to produce the very violent effects witnessed.

Bethnal Green, August 4, 1849.

*Rain the Cause of Lightning.**

GENTLEMEN:—As the whole science of meteorology depends upon the number of phenomena observed, I am led to trouble you with the following short notice of a phenomenon which particularly engaged my attention during its occurrence; if you deem the communication worthy to be inserted in your Journal, you will oblige

T. H. DIXON.

Leeds, October 17, 1849.

I observed a paper upon this subject in the Philosophical Magazine for September last, and it reminded me that I had observed a similar phenomenon, of which I made some notes at the time of its occurrence.

On the evening of June 4, 1849, a very severe thunder-storm visited Leeds and the neighborhood. My attention was particularly directed to this storm from a peculiar circumstance connected with it; the storm begun about 9 P. M., and continued until 12, but the rain did not begin till 11. The whole of the shower which followed was characterized by the wave-like intensity of the falling rain; first the shower began very violently, and gradually got less intense, until succeeded by another sudden increase, and during the whole storm this increase and decrease could be distinctly marked. I also noticed a similar circumstance at Redcar in July, and can most certainly bear witness that, in many instances, the increase of rain preceded the flash of lightning, and this occurred many times in succession. If, from observation, we find the rain during thunder-storms has this peculiar characteristic, we may safely consider that rain has something to do with the production of electricity, but as yet our observations are so limited, that it would be unsafe to form any theory; but we may hope the phenomenon will be observed by others, and also that they will make their conclusions known, and ultimately we may be led to a new meteorological fact.

On the Means of Preventing the Corrosion of Steam Boilers.†

The writer proposes to effect the prevention of the corrosive action exerted by the water on the interior of boilers, by applying over the whole of the inside a thin coat of varnish, of such a nature that, while it would remain unaffected by the high temperature to which it would be exposed,

* From the London, Edinburgh, and Dublin Philosophical Magazine, for November, 1849.

† From the London Artizan, for December, 1849.

it should offer no serious resistance to the regular transmission of heat from the iron to the water. To effect this object, he proposes to pour a small quantity of coal tar into the water, immediately before the steam is about to be got up. This substance possesses the singular property, when thrown into boiling water, of parting with its volatile portions, and diffusing the remainder of its substance, as a hard insoluble pitch, all over the interior of the vessel, effectually preventing a sufficiently close contact between the water and sides to allow of chemical action, while it is so superficial as not to impair the efficiency of the boiler, by lessening the conducting power of its surface.

*On the Present State of Electro-Telegraphic Communication in England, Prussia, and America. By MR. WHISHAW.**

Mr. Whishaw stated that the object of his present communication was not to bring before the Section the numerous telegraphic instruments now in use and recently made public; but to point out the advantages and disadvantages of the three great systems of electric telegraphs now in operation in England, Prussia, and America. In England the wires, being suspended from post to post along the sides of railways, are exposed to the following disadvantages—running of trains off the lines, by which the posts and wires are all carried away together, and thus the communication is stopped. Secondly, from atmospheric influences, whereby irregular and uncertain deflexions of the needles in Cooke and Wheatstone's telegraphic instruments take place, besides occasional declination to parts of the instruments, &c. Thirdly, from snow storms, as in the case of the South-Eastern telegraph which occurred during the last winter, when the wires and posts were all removed, and considerable interruption was caused in the transmission of communications. Fourthly, from damage by malicious persons, who sometimes twist the wires together, and for whose apprehension rewards have frequently been offered by the English companies. Fifthly, the wires have sometimes been connected together by a fine wire nicely soldered to the line wires, and thus the communications have been diverted from their right channel. Sixthly, the expense, viz., £150 a mile, for the above-ground system, with an annual expenditure for repairs. Seventhly, and consequently, heavy charges for the transmission of messages. Eighthly, the time required in learning perfectly the manipulations of the needle telegraph, so that if a telegraphist is from any cause disabled, there is no one at hand to take his place.

With regard to the charges, the following facts will suffice to show the advantages of economical telegraphs. In America, the charge for twenty words transmitted by the telegraph to the distance of 500 miles is but 4s.; whereas, by the English company's charges, the same communication would only be transmitted 60 miles, or less than one-eighth the distance, and by the South-Eastern Company's charges, not 20 miles, or one twenty-fifth of the 500 miles. Again, a communication of ninety words, in America, may be transmitted from Washington to New Orleans, 1716 miles, for 41s. 8d.; whereas, by the Electric Telegraph Company's charges, it

* From the London Athenæum, for September, 1849.

would only be transmitted a little more than 200 miles,—and by the South-Eastern Company's scale, under 100 miles.

The extent of telegraphs in Great Britain at present is about 2000 miles; and there yet remain railways to an equal extent without telegraphs. Mr. Whishaw expressed a hope that within a short time every principal town in the kingdom would be connected by telegraph, as the under-ground system may be effected without the aid of railways, viz., under turnpike roads and towing paths, &c. This plan has been practically carried out in Prussia, where, at the present time, there are 319 German miles = 1492·92 English miles in actual operation. A single wire, coated with gutta percha, is laid under the railway at a depth of two feet, and connected with the instruments and batteries at the different stations. A colloquial and also a printing telegraph are used in each principal station—both worked, as required, by the single wire.

The experiment as to burying the gutta percha wire in the ground was commenced some years ago, and being found to answer perfectly, the Prussian Telegraph Commissioner appointed in 1844 determined on adopting the underground plan entirely for the government telegraphs, and which were commenced in July, 1848, so that no time has been lost in carrying them out. At Oderbay, the Prussian system is, in connexion with the telegraphic line now in course of construction between that place and Trieste viâ Vienna, and, as regards the Prussian Government Telegraphs, the public has the advantage of them by payment of certain fixed rates. The cost of the Prussian system is under £40 a mile.

The American system is remarkable for the great extent to which it is already carried, viz., 10,511 miles, costing less than £20 a mile. It consists of a single iron wire supported from post to post, but is carried far beyond the limits of railways, and is consequently frequently damaged, so that a code of rules is established for the repair of the wires, which is undertaken by gentlemen living along the lines, and who are furnished with a set of tools for the purpose—their reward being the free use of the telegraphs for their own private communications. The economy of first cost, however, causes a very low tariff for the transmission of communications, so that the poorest person is enabled, for a few cents, to send a communication to a considerable distance. From the actual operations of the three systems, it appears that the Prussian is the most simple, effective, and economical—for annual repairs are not required to the line wires, as in the cases of England and America, where they are exposed to so many casualties.—*Proc. Brit. Assoc.*

*On the Friction of Water. By R. RAWSON, ESQ.**

The object of this paper was to ascertain the friction of water on a vessel or other floating bodies, rolling in water. For this purpose experiments have been made upon a cylindrical model, whose length is 30 inches, diameter 26 inches, and weight 255·43 lbs. avoirdupois, in the following manner: The cylinder was placed in a cistern, in the first place, without water, and made to vibrate on knife-edges passing through the axis of the

* From the London Mechanics' Magazine, for September, 1849.

cylinder. A pencil projecting from the model in the direction of the axis of the cylinder, on the surface of another movable cylinder, marked out upon paper placed upon this last cylinder the amplitude of each oscillation. The cylinder was deflected over to various angles, by means of a weight attached by a string to the arm of a lever fixed to the cylindrical model:

Angle of Deflexion.					Angle to which the Model vibrated.				
22°	30'	.	.	.	22°	24'	.	.	.
22	10	.	.	.	22	6	.	.	.
21	54	.	.	.	21	48	.	.	.
21	36	.	.	.	21	30	.	.	.
&c.					&c.				

When the cylinder oscillated, in all circumstances the same as above, except being surrounded by salt water, the amplitude of oscillations were as follows:

Angle of Deflexion.					Angle to which the Model vibrated.				
22°	30'	.	.	.	22°	0'	.	.	.
21	36	.	.	.	21	3	.	.	.
20	48	.	.	.	20	16	.	.	.
&c.					&c.				

Clearly showing that amplitude of vibration, when oscillating in water, is considerably less than when oscillating without water. In the above instance there is a falling off in the angle of amplitude of 24', or nearly half of a degree. This amount has been confirmed by several experiments made with great care; and it appears only fair to attribute this decrease in the amplitude of oscillation to the circumstance of the friction of the water on the surface of the cylinder. The amount of force acting on the surface of the cylinder, necessary to cause the decrease in the amplitude of oscillation shown by the experiment was calculated; and the author thinks that this amount of force is not equally distributed on the surface of the cylinder. In consequence of this, he thought the amount on any particular part might vary as the depth. On this supposition, a constant pressure at a unit of depth is assumed. This, multiplied by the depth of any other point of the cylinder immersed in the water, will give the pressure at that point. These forces or moments being summed by integration and equated with the sum of the moments given by the experiments, we shall have the following value of the constant pressure at a unit of depth: .0000469. The constant of another experiment, (the weight of the model being 197 lbs. avoirdupois, and consequently the part immersed in the water was very different from the other experiment,) was .0000452, which differs very little from the former, showing that the hypothesis assumed in the computation is not far from the truth.—*Proc. Brit Assoc.*

For the Journal of the Franklin Institute.

Launch of the U. S. Steamship "Powhattan."

This splendid steamer was launched from the Gosport Navy Yard, Norfolk, on Thursday, Feb. 14, 1850. The following are her dimensions:—Length of keel, 246 feet; between perpendiculars, 250 feet; extreme length from billet to taffrail, 276 feet 6 inches; on deck, 251 feet 6 inches; breadth of beam, 45 feet; over guards, 69 feet 6 inches. She is to have side

wheels, be propelled by two inclined engines, with cylinders 70 inches diameter and 10 feet stroke, and will have four copper boilers. Her machinery is in course of construction by A. Mahaffy & Co., whose establishment is adjoining the Navy Yard, and the ship is expected to be ready for trial during the year. W.

On the Strength of Materials. By GEORGE BUCHANAN, ESQ., F. R. S. E.*

In this exposition, Mr. Buchanan, after apologising for the length to which he had been imperceptibly drawn in these communications, commenced by recapitulating the general principles which had formerly been laid down regarding the tensile and compressive strains of materials, and, in addition to the results of former experiments, made at the request of the Society, on the stones from different quarries in the neighborhood, gave now the results of others, which had since been carefully made on the harder materials of Caithness and Arbroath pavement, along with white marble and whinstone, as follows, viz:—

	Tensile.	Compressive.
Whinstone,	1469 lbs. . . .	8270 lbs.
Arbroath pavement,	1261	7884
Caithness do. . . .	1054	6493
Marble,	722	6431

In all these experiments the peculiar nature of the two strains is distinctly exhibited; the specimens exposed to the tensile strain showing a clean fracture and no fragments; those exposed to the compressive being generally crushed to powder, and the fragments flying in all directions by lateral divergence; and generally, when any considerable fragment remains, showing the appearance of a pyramid from which the sides of the square had been broken—a form which has also been observed in the compression of cast iron.

In regard to the transverse strength, he repeated the principles and general rule for calculation formerly explained, by adopting what he termed a unit of strength, which differs in each material, but, being once determined by actual experiment, affords a *datum* for calculating the strength of that material in every case, whatever be the dimensions of the masses acted on. This unit expresses the strength of a cubic inch of the material—*i. e.* a bar 1 inch square, supported on bearings 1 inch apart, and loaded in the middle till it breaks. The strength of such a unit for cast iron had been given on a former evening at 11 tons. In regard to timber, he had himself made various experiments on Memel fir, and had found the unit 4000 lbs. Oak and beech, by other experiments, was found 6000 lbs.; ash, 8000 lbs.

In regard to the transverse strength of stones, few experiments, he said, had been made on our building materials, although it was a strain they were much subjected to in stairs, balconies, covers of conduits, &c. He proposed, therefore, to try several specimens which were now before the meeting—viz., Hailes pavement, Craighleith, and Arbroath. Each of these specimens was 3 inches thick, 9 inches broad, laid flatways and supported at each end between two upright pillars, the distance between the bearings

* From the London Civil Engineer and Architect's Journal, for December, 1849.

being exactly 3 feet. These specimens were loaded by weights successively laid on a scale hung from the centre of the pavement, until it broke. The Hailes was first tried, and, after carrying successively 4 cwt. and 5 cwt. for a little time, at last it gave way with 7 cwt. 10 lb. A specimen of the same rock and dimensions, previously tried, gave nearly the same result, being $7\frac{1}{4}$ cwt. The Craighleith carried considerably more. After bearing 7 cwt. and 8 cwt. for some time, it gave way at last with $10\frac{1}{4}$ cwt. The Arbroath pavement was found still greatly ahead even of the Craighleith. After carrying 12 cwt. and 14 cwt. for some time, it went on bearing $16\frac{1}{2}$ cwt. This it bore for a short interval; and while an additional weight was in the act of being put on it gave way. These experiments are important, and appeared to excite much interest. From these the unit of strength is easily calculated.—*Proc. Roy. Scot. Soc. Arts.*

*On a New Thermometric Scale. By MR. S. M. DRACH.**

Having lately had occasion to advert to the superior practical utility of Fahrenheit's thermometric scale, as not ordinarily requiring decimal divisions and negative degrees like its congeners, it occurred to me that a superior scale was feasible by dividing the distance from -40° Fahr. = -40° Cent. = -32° Reaum., unto the boiling point $+212^{\circ}$ Fahr. = $+100^{\circ}$ Cent. = $+80^{\circ}$ Reaum., into one thousand degrees, placing zero at the former temperature. Thus one of my degrees = $0^{\circ}\cdot252$ Fahr. = $0^{\circ}\cdot140$ Cent. = $0^{\circ}\cdot112$ Reaum.; and, except for some chemical purposes and extraordinary arctic temperatures, *no negative degrees would be necessary.*

If the zero were placed at

$$\begin{aligned} -38^{\circ} \text{ Fahr.} &= -38^{\circ}\cdot8 \text{ Cent.} = -31^{\circ} 1 \text{ Reaum.}, \\ \text{my degree} &= \frac{1}{4} \text{ Fahr.} = \frac{10}{72} \text{ Cent.} = \frac{1}{9} \text{ Reaum.} \end{aligned}$$

easier for marking off the point of melting ice in whole degrees. Some of the prominent points in these two scales are as follows:

Mercury freezes	—	32°F.	= +	$4\cdot0$ (1)	or —	4 (2)
Fahrenheit's zero	+	0	=	158·7	= +	152
Ice melts	+	32	=	285·7	=	280
Water's max. density	+	39	=	313·5	=	308
Medium temp. 10° C.	+	50	=	357·1	=	352
Equatorial temp.	+	84	=	492·1	=	488
Blood heat	+	98	=	547·6	=	544
Greatest heat felt, say	+	150	=	754·0	=	752
Alcohol boils	+	174	=	849·2	=	848
Water boils	+	212	=	1000·0	=	1000
Mercury boils	{	655	=	2758·0	=	2772
		+ 672	=	2825·4	=	2840

In a small tract printed ten years ago, I showed that the idea of an absolute zero of cold expressible by a thermometer (Library of Useful Knowledge, *Heat*, ch. viii.) involved some fallacy. Fill a cylindrical tube with a heat-dilatable fluid, *e.g.* air, and continuing the divisions to each end of the tube, we should find that as air expands $\frac{1}{430}$ th in volume per de-

* From the London, Edinburgh, and Dublin Philosophical Magazine, for January, 1850.

gree from 32° Fahr. to 212° Fahr., the bottom of the tube would have $-480 + 32 = -448^{\circ}$ Fahr. marked on it. Fill such a tube with mercury, which expands $\frac{1}{99960}$ th per degree betwixt the same extremes, and the bottom of the tube will indicate -9958° Fahr. Now could the substance ever contract to the bottom of the tube, its density must become infinitely great, as it then forms an infinitesimally thin stratum. May it therefore not be concluded that every substance has its own minimum temperature for maximum density, above or below which it expands just as water on each side of 39° Fahr.; the latter fluid having the lion's share of this peculiarity, just as magnetism is ordinarily visible in iron above all other metals, resembling in some sort the elective affinity so common in chemical combinations?

London, December 6, 1849.

For the Journal of the Franklin Institute.

Launch of three Steamers.

On Monday, the 28th of January, there was launched from the yard of William H. Brown, in New York, at the same time, three steamers, the "New World," the "Boston," and the "Artic." The "New World" had all her machinery up and steam on, and as soon as she was fairly in the water her engine was put in motion, and she made an excursion about the harbor, and sailed for California about two weeks after. She was 216 feet long, 27 feet beam, and had a single engine, with cylinders 40 inches diameter and 11 feet stroke. She may be called a semi sea steamer, being a compound of the ordinary sea steamer and our river boats. She will, no doubt, make a quick trip around.

The "Boston" was about 750 tons, and the "Artic" was one of the Collins line of Liverpool steamers, and the third launched. She is over 3000 tons burthen, and is to have side wheels and two side lever engines, with cylinders 95 inches diameter, and 10 feet stroke. X.

For the Journal of the Franklin Institute.

United States Naval Dry Docks.

At the present time, our Government have in progress four different dry docks, capable of docking the largest vessel afloat. These docks, from their great size and the many improvements that have been introduced, are far superior to any at present in use in Europe, and are such as to merit the attention of the readers of the Journal.

Of the four now building one is at Philadelphia, and is known as the floating *sectional* dry dock. It is patented by Messrs. Dakin, Moody, Burgess & Dodge, who are at present constructing this one for the Government, a considerable portion of which is already completed, and the balance in progress. When finished, this dock will consist of 10 sections, each of which has the capacity to raise 800 tons—total power 8000 tons—and will take up a vessel of 350 feet in length. Six sections will raise a ship of the line, and the four remaining sections will raise a frigate. The sec-

tions are placed side by side, and connected by timbers at the top of the tanks. The pumps for exhausting the sections are worked by four steam engines,—two of 20 and two of 12-horse power. One of each size is used on each side of the dock, and placed so that the two 20-horse engines exhaust 6 sections, and the two 12-horse engines exhaust 4 sections, a perfect uniformity of level being maintained by suitable connexions.

In connexion with the dock, there is a large stone basin, the sides and bottom being of granite. This basin is 350 feet long and 226 feet wide, and contains a sufficient depth of water, at ordinary high tide, to float the dock and the vessel it may contain.

Immediately adjacent to, and connected with, the basin, are two railways on the main land. These railways are to be of the most substantial character, and fully capable of sustaining any vessel the dock will raise.

The operation of the whole is as follows: The sections of the dock are hauled out into the river, and water let into them until they sink deep enough to allow the vessel to be floated in. As soon as this takes place, and the vessel is properly secured, the water is pumped out of the sections, and the vessel raised out of the water. When this has been accomplished, the whole is floated into the stone basin and allowed to ground on the bottom, when the vessel may be hauled on the railway. This is effected by means of a hydraulic cylinder, of 36 inches diameter and 12 feet stroke, worked by an engine of 40-horse power. If necessary, two vessels may be put on the railways, and a ship of the line and frigate left on the dock, so that the capacity of the dock is equal to four vessels of large class. When required, additional ways may be put up in connexion with the basin. The whole will be completed during 1851, but some of the sections will be ready this season.

B.

For the Journal of the Franklin Institute.

An Account of the Explosion of a Steam Boiler in Hague St., New York.

This boiler, which exploded on the morning of the 4th of February, was in form what is termed "Montgomery's Patent." It was built in 1847 for Mr. Taylor, but, in consequence of some trouble between him and the builders, (Milligan & Walker,) he then refused to take it, and it was sold by them, to be used in a steamboat at Savannah; but the boiler proving too small, it was sent to Pease & Murphy, in New York, to be sold. While in their possession it was kept in the open air, but was well painted externally, and could have been injured but little. Mr. Taylor recently purchased the boiler from them to use in his machine shop; it was put up in the cellar of his premises, and was first used on Tuesday, the 29th of January, six days previous to the explosion. On using it the first day, with a pressure of 80 lbs. of steam, a loud report was heard, and, on examination, water was found to be running freely out of the boiler from the inverted arch, and the brace A was found to have parted. They were obliged to haul the fire, let out the water, and remove a part of the broken brace that was attached to the tube sheet,—cut out the rivets, and then fill the holes with bolts; but no attempt was made to replace the brace.

After putting in the bolts and caulking the crown of the inverted arch, the boiler was again filled with water and steam raised; and, although they were aware that the boiler was not strong enough for 80 lbs. pressure, yet being behind with their work, and having to run during the night, Mr. Ford, the foreman of the establishment, moved out the weight on the safety valve lever to 90 lbs.; but before the steam blew off at that point, another loud report was heard, and the boiler found to be leaking badly. Mr. George Birkbeck, Jr., an engineer in business in New York, was then called upon to repair it. Mr. B. reports that, on examining the boiler, he found a fracture across the ends of the legs under the bridge-wall, at the points marked B and C, at which place, and also in the crown of the inverted arch, the boiler had leaked badly,—so bad that, on his arrival, the water had entirely leaked out. Patches were put on over the fractures at B and C in the legs, and the crown of the inverted arch was again recaulked. Mr. Taylor was then informed by Mr. Birkbeck that the boiler was not sufficiently strong to sustain the pressure of steam that they were using, and that, in his opinion, the working pressure should not exceed 50 lbs. under any circumstances. Yet, notwithstanding all these symptoms of weakness, and the opinion of one well acquainted with such matters, the usual pressure of steam (90 to 100 lbs.) appears to have been carried during the remainder of the week.

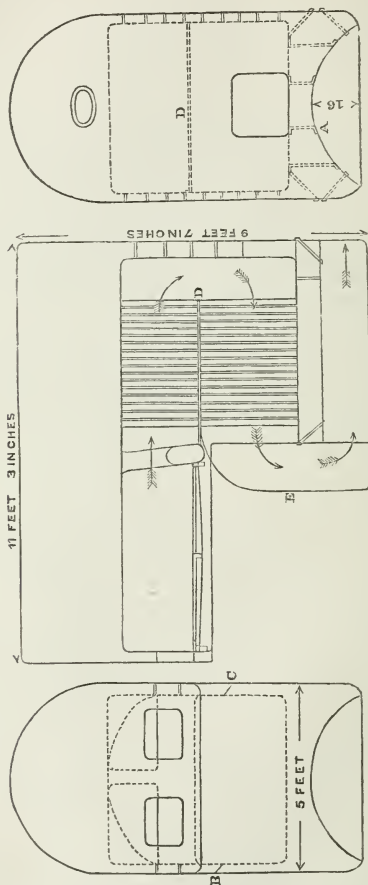
On Sunday the engineer, for the purpose of stopping the leaks in the boiler, put in it a quantity of horse manure and paper pulp,—articles which are sometimes used for that purpose. On Monday, (the day of the explosion,) the engineer appears to have been in the building as early as usual, but, from the testimony of the watchman on the premises, he did not succeed in starting his fire, and called upon him to assist him. In consequence of this delay, steam was not raised sufficiently by 7 o'clock, (the hour for commencing work,) and from the testimony of Mr. Brown, the chief smith of the establishment, we learn that his attention was called to the boiler by a peculiar smell emitted from it, as if the gaskets were burning;—that on trying the water gauge, (one of Worthington's percussion,) he could not find water, and that he then lifted the safety valve lever, when the steam that escaped, to use his own expression, "looked blue," which, being different from what he had often before observed, caused him to speak to the engineer about it, who told him to mind his own business. This was but three or four minutes previous to the explosion. The impression was so strong on his mind that something was wrong, that he was about leaving the building at the time of the explosion, and, by jumping, saved himself from the ruins.

The testimony given at the Coroner's Inquest, in relation to all the points here stated, is direct and positive. All testify that the boiler was not suitable for the pressure carried upon it; but Mr. Taylor himself says he used it the two days previous to the explosion with 100 lbs. of steam, and that he considered it safe at that pressure.

Having collected all the information I could get from authentic sources upon the subject, and having visited the premises and examined the various parts of the boiler, I am of the opinion that the boiler was entirely too weak for the pressure of steam that it was expected to sustain. It is hardly necessary, in support of this, to give anything more than the testimony

that has been referred to; but, on examining the crown of the inverted arch, it will be seen that, for a distance of $3\frac{1}{2}$ feet in length, by the same in width, there was not a single brace,—a piece of gross negligence, and inexcusable in any one professing to manufacture boilers for practical use.

Fig. 1.

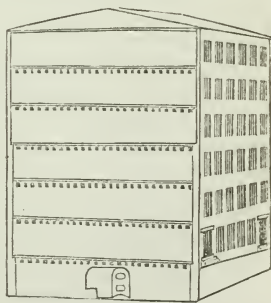


All the symptoms of weakness shown in the boiler previous to the explosion were in that part. But, notwithstanding this, I think the immediate cause of the explosion was owing to a short supply of water. I am led

to this conclusion from the testimony of Brown, and from the fact that the explosion occurred immediately after starting the engine,—a result which has been demonstrated, from experiment and practice, to be intimately connected with low water. Explosions that take place when there is an abundant supply of water, generally occur while there is no steam being drawn from the boiler, or in cases where the supply of steam exceeds the amount taken away. If we take a boiler with a full supply of water, and secure the safety valve so that it shall raise just previous to the steam reaching that point that will explode the boiler, the raising of the valve will relieve the pressure, and the boiler will be saved; but if we take the same boiler with a short supply of water, and safety valve secured as before, the raising of the valve, by causing the water to rise on the overheated iron, will to a certainty cause an explosion. I therefore assume that, in the absence of positive evidence to the contrary, all explosions that take place at the starting of the engine are caused by the absence of the proper supply of water.

This boiler was 11 feet 3 inches long, 5 feet wide, and 9 feet 7 inches high at the back end; it contained 289 vertical tubes, 4 feet 10 inches long, 2 inches outside diameter. The plate D has as many holes through it as there are tubes, and is secured in its place when the boiler is built. By the use of this plate, the flame is caused to pass between the tubes at their upper end, near the surface of the water, and to return to the front below near the bottom; it then returns to the back end again under what has been termed the inverted arch. The casing E is of sheet iron. The socket bolts in the legs of the boiler were screwed in, and slightly riveted over. The thickness of the shell and furnace was full $\frac{1}{4}$ inch. The safety valve was $2\frac{1}{2}$ inches diameter, and, with the weight at the outer notch, indicated 112 lbs.

The annexed diagram is an approximate one to the building occupied by A. B. Taylor & Co. Front of building about 50 feet, depth about 75 feet; 6 stories high; walls 18 inches thick to the third story, and above that 12 inches. The boiler and engine were in the cellar. The building was situated between other brick buildings, and in contact with them, but its walls were independent. The whole building was destroyed by the explosion, being lifted from its foundation and falling in one mass of ruins, burying 120 persons who were employed in it. Of that number 70 were killed, and nearly all the rest much injured. An explosion so disastrous in its consequences has never before taken place in this country, and it is incumbent on the authorities of each State that they require all boilers on land to be annually inspected, and prohibit the placing of them inside of large buildings. By this means something will be gained, and the loss of life be materially diminished.



The only portion of the boiler that retains its original shape is the tube

box and tubes,—these are comparatively uninjured, while all the rest is torn to pieces. The inverted arch has not yet been found, but it was separated completely from the rest of the boiler. The shell was divided in two pieces and flattened out; the separation took place midway in the length of the boiler, in line with the water bridge wall, and one piece, as found, was composed of the sides of the boiler that extended down to the inverted arch, (the socket bolts which held it to the tube box were all torn out,) and the portion of the crown above it. The other piece was composed of the crown and sides of the boiler, over and at the sides of the furnace; and also the entire sides and top of the furnace, which were separated lengthwise, as marked at *a*; the socket bolts were torn out, and the whole forms one large flat sheet. The entire front end of the boiler, with the front of the furnace and furnace door, was blown off in one piece; the back end is still attached to the tube box by the socket bolts, but is



very much injured. The safety valve was blown off, taking with it a round piece of the shell of the same diameter as its flanch;—when found it was but little injured, and the weight was secured, (by means of a rope inside of it,) so that it could not have been inside the last notch, or not less than 112 lbs., leaving $1\frac{1}{2}$ inches of lever outside; if the weight was at the extreme end, then it would retain a pressure of 120 lbs.

The character of vertical tubular boilers is in nowise affected by this explosion. When duly proportioned they will be found economical, and must come into use where economy of fuel and space is an object. B.

For the Journal of the Franklin Institute.

Experiments on Paddle Wheels for Marine Steamers.

For the purpose of testing a new form of paddle for marine steamers, E. K. Collins, Esq., of New York, has had them applied to the wheels of the steamer "Penobscot," now running between Philadelphia and New York by sea. The paddles are of iron, $\frac{3}{8}$ in. thick, curved to the annexed sketch, the concave part



striking the water. The result of the experiments will no doubt be made public.

On the Direct Production of Heat by Magnetism. By W. R. GROVE, Esq.*

The author recites the experiments of Marrain, Beatson, Wertheim, and De la Rive, on the phenomenon made known some years ago, that soft iron, when magnetized, emitted a sound or musical note. He also mentions an experiment of his own, where a tube was filled with the liquid in which magnetic oxide had been prepared, and surrounded by a coil; this showed to a spectator looking through it an increase of the transmitted light when the coil was electrified. All these experiments, the author considers, go to prove that, whenever magnetization takes place, a change is produced

* From the London Athenæum, for June, 1849.

in the molecular condition of the substances magnetized; and it occurred to him that, if this be the case, a species of molecular friction might be expected to obtain, and by such molecular friction heat might be produced. In proving the correctness of these conjectures difficulties presented themselves, the principal of which was that, with electro-magnets, the heat produced by the electrized coil surrounding them might be expected to mask any heat developed by the magnetism. This interference the author considers he eliminated by surrounding the poles of an electro-magnet with cisterns of water, and by this means, and by covering the keeper with flannel, and other expedients, he was enabled to produce in a cylindrical soft iron keeper, when rapidly magnetized and demagnetized, a rise of temperature several degrees beyond that which obtained in the electro-magnet, and which, therefore, could not have been due to conduction or radiation of heat from such magnet. By filling the cisterns with water colder than the electro-magnet, the latter could be cooled while the keeper was being heated by the magnetization.

The author subsequently obtained distinct thermic effects in a bar of soft iron placed opposite to a rotating permanent steel magnet. To eliminate the effects of magnético-electrical currents, the author then made experiments with non-magnetic metals, and with silico-borate of lead, substituted for the iron keepers, but no thermic effects were developed. He then tried the magnetic metals nickel and cobalt, and obtained thermic effects with both, and in proportion to their magnetic intensity.

Some questions of theory relating to the rationale of the action of what are termed "the imponderables," and to terrestrial magnetism, were then discussed, and the author concluded by stating that he considers that his experiments prove that, whenever a bar of iron or other magnetic metal is magnetized, its temperature is raised.—*Proc. Roy. Soc.*

For the Journal of the Franklin Institute.

Fresh Water in Marine Boilers.

"Z." is informed that such a condenser as he alludes to is now in progress of erection, by Merrick & Son, of this city, on board the steamer "Osprey." It is the invention of a Mr. Pirsson, of New York. The distinguishing feature between it and all others that have been used for the same purpose, is that, in this, the tubes have a vacuum outside as well as in them, and therefore are not liable to leak. B.

*Protection of Iron from Oxidation.**

At the Exposition at Paris, in 1849, there were exhibited numerous articles manufactured in iron, covered with a kind of transparent vitreous coating, completely spread over the surface of the metal like a varnish, and capable of affording a perfect protection against the action of the air, or any other oxidizing agent. This appears to be an invention susceptible of many useful applications; for, whether the iron be in the state of a rolled

* From the London Civil Engineer and Architect's Journal, for February, 1850.

plate or bar, or drawn into tubes; whether it be cast into water pipes or into articles of the most elaborate form and design, as vases and other ornamental works, it can be equally well endowed with this protective coating;—it is also a matter of indifference whether the article be made of forge or cast iron.

The following is stated to be the process employed in imparting to the iron the vitreous surface:—Firstly, the object, whatever its shape may be, is thoroughly cleansed by dilute acid, which serves to remove from the metallic surface, grease, dirt, and every trace of oxide; this is important, for, if any foreign matter remain upon the surface, the perfect adherence of the fused glass will be effectually prevented, when that part of the operation is reached. After the action of the dilute acid, the work is to be well washed and then dried; when perfectly dry, it must be brushed over with a tolerably strong solution of gum arabic, which may be applied by means of a camel-hair brush. Over the whole extent of the gummed surface powdered glass, of a peculiar kind, is then sifted, and care must be taken to cover every part of the surface with this powder, otherwise the vitreous coating will be imperfect when the operations are completed.

When thus prepared, the work is introduced into a furnace or retort, heated to 100° or 150° centigrade (212° to 302° F.); and, when thoroughly dry, it is removed to another furnace, where it is brought to a cherry-red heat; the vitreous matter which adhered to the gummed surface of the metal now undergoes fusion;—the progress of this stage of the process is ascertained by looking through a small opening (contrived for the purpose) in the heated chamber. When the fusion is complete, and the glass seems to have flowed over the whole surface, the article is removed from the furnace and placed in a close chamber, from which the air is entirely excluded—here it is kept until it has cooled down to the temperature of the atmosphere.

The vitreous compound applied to the surface of the metal consists of the following substances:—Powdered flint glass, 130 parts; carbonate of soda, $20\frac{1}{2}$ parts; boracic acid, 12 parts. These must be melted together in a “glass pot,” and a fusible glass will be the result; when cold, this must be pounded with care, so that it may be reduced to a powder sufficiently fine to pass through a silk sieve. When thus prepared, it is ready to be applied to the surface of the iron, according to the method described above. If, after the first process, the coating of vitrified matter on the metal should prove not to be quite perfect, the manipulation must be repeated, a second coat of powdered glass being applied in the same manner as the first. It is necessary that the vitreous matter which forms the coating should be free from foreign matter, for if the object to be coated be oxidized or greasy, the coating of glass will not adhere, and the result of the operation will be, consequently, very imperfect.

*On the Diffusion of Liquids. By PROF. GRAHAM.**

The characters of liquid diffusion were first examined in detail with reference to common salt. It was found, first, that, with solutions containing

* From the London Athenæum, for January, 1850.

1, 2, 3, and 4 per cent., the quantities of salt which diffused out of an open phial of 1.25 inch aperture, properly filled, into the water of a large jar, in which the phial was entirely immersed, in a constant period of eight days, were as nearly in proportion to these numbers as 1, 1.99, 3.01, and 4.00; and that, in repetitions of the experiments, the results did not vary more than $\frac{1}{40}$ part. The proportion of salt which diffused out in such experiments amounted to about $\frac{1}{8}$ of the whole. Secondly, that the proportion of salt diffused increases with the temperature, an elevation of 80° F. doubling the quantity of chloride of sodium diffused in the same time.

The diffusibility of a variety of substances was next compared, a solution of 20 parts of the substance in 100 water being always used. Some of the results were as follows, the quantities diffused being expressed in grains: chloride of sodium 58.63, sulphate of magnesia 27.42, sulphate of water 69.32, crystallized cane sugar 26.74, starch sugar 26.94, gum arabic 13.24, albumen 3.03. The low diffusibility of albumen is very remarkable, and the value of this property in retaining the serous fluids within the blood vessels at once suggests itself. It was further observed that common salt, sugar, and urea, added to the albumen under diffusion, diffused away from the latter as readily as from their aqueous solutions. Urea itself is as highly diffusible as chloride of sodium.

In comparing the diffusion of salts dissolved in ten times their weight of water, it was found that isomorphous compounds generally had an equal diffusibility: chloride of potassium corresponding with chloride of ammonium, nitrate of potash with nitrate of ammonia, and sulphate of magnesia with sulphate of zinc. The most remarkable circumstance is, that these pairs are "equi-diffusive,"—not for chemically equivalent quantities, but for equal weights simply. The acids differed greatly in diffusibility, nitric acid being nearly four times more diffusive than phosphoric acid; but these substances also fell into groups,—nitric and hydrochloric acids appearing to be equally diffusive; so also acetic and sulphuric acids.

Soluble sub-salts and the ammoniated salts of the metals present a surprisingly low diffusibility. The quantities diffused in similar circumstances of the three salts, sulphate of ammonia, sulphate of copper, and the blue ammonio-sulphate of copper, being very nearly as 8, 4, and 1. When two salts are mixed in the solution cell, they diffuse out into the water atmosphere separately and independently of each other, according to their individual diffusibilities. This is quite analogous to what happens when mixed gases are diffused into air. An important consequence is, that in liquid diffusion we have a new method of separation or analysis for many soluble bodies, quite analogous in principle to the separation of unequally volatile substances in the process of distillation. Thus it was shown that chlorides diffuse out from sulphates and carbonates, and salts of potash from salts of soda; and that, from sea water, the salts of soda diffuse out into pure water faster than the salts of magnesia. The latter circumstance was applied to explain the discordant results which have been obtained by different chemists in the analysis of the water of the Dead Sea, taken near the surface;—the different salts diffusing up into the sheet of fresh water, with which the lake is periodically covered, with unequal velocity.

It was further shown that chemical decompositions may be produced by

liquid diffusion: the constituents of a double salt of so much stability as common alum being separated, and the sulphate of potash diffusing in the largest proportion. In fact, the diffusive force is one of great energy, and quite as capable of breaking up compounds as the unequal volatility of their constituents. Many empirical operations in the chemical arts, it was said, have their foundation in such decompositions. Again, one salt, such as nitrate of potash, will diffuse into a solution of another salt, such as nitrate of ammonia, as rapidly as into pure water,—the salts appearing mutually diffusible, as gases are known to be. Lastly, the diffusibilities of the salts into water, like those of the gases into air, appear to be connected by simple numerical relations.

These relations are best observed when dilute solutions of the salts are diffused from the solution cell, such as 4, 2, or even 1 per cent. of salt. The quantities diffused in the same time from 4 per cent. solutions of the three salts, carbonate of potash, sulphate of potash, and sulphate of ammonia, were 10·25 grains, 10·57 grains, and 10·71 grains, respectively, and a similar approach to equality was observed in the 1, 2, and $6\frac{2}{3}$ per cent. solutions of the same salts. It also held at different temperatures. The acetate of potash appeared to coincide in diffusibility with the same group, and so did the ferrocyanide of potassium. The nitrate of potash, chlorate of potash, nitrate of ammonia, chloride of potassium, and chloride of ammonium formed another equi-diffusive group.

The *times* in which an equal amount of diffusion took place in these two groups appeared to be as 1 for the second to 1·4142 for the first, or as 1 to the square root of 2. Now, in gases the *squares of the times* of equal diffusion are the *densities of the gases*. The relation between the sulphate of potash and nitrate of potash groups would, therefore, fall to be referred to the diffusion molecule and diffusion vapor of the first group having a density represented by 2, while that of the second group is represented by 1. These were named the *solution densities* of the salts in question. The corresponding salts of soda appeared to fall into a nitrate and sulphate groups also, which have the same relation to each other as the potash salts. The relation of the salts of potash to those of soda, in times of equal diffusibility, appeared to be as the square root of 2 to the square root of 3; which gives to them solution densities of 2 and 3. Hydrate of potash and sulphate of magnesia were less fully examined; but the first presented sensibly double the diffusibility of sulphate of potash, and four times the diffusibility of the sulphate of magnesia.

If these times are all squared, the following remarkable ratios are obtained for the solution densities of these different salts, each of which is the type of a class of salts: hydrate of potash 1, nitrate of potash 2, sulphate of potash 4, sulphate of magnesia 16, with nitrate of soda 3, and sulphate of soda 6. In conclusion, it was observed that it is the diffusion molecules of the salts, having such densities, which are concerned in solubility, and not the Daltonian atoms or equivalents of chemical combination; and the application was indicated of a knowledge of the diffusibilities of different substances to the study of endosmose, in which the proper function of the membrane would be distinguished from that of the salt.—*Proc. Roy. Soc.*

For the Journal of the Franklin Institute.

Economy of the Steam Engine.

In the last number of the Journal I stated the causes of loss, which were, first, insufficiency of power produced, by having an engine too small for the work to be done, or boilers too small for the engine, or from both these causes combined.

The great loss that ensues in this city from the use of too small an engine can hardly be estimated. Those who use them appear not to be aware of the advantages of using steam expansively; and as, in fitting up their works, first cost instead of economy of fuel has been the principal object kept in view, they go into operation with an engine much below the size required, and with boilers just sufficient to supply it with steam; and go on working steam full stroke, with their fires constantly agitated to make a sufficient supply. If they would double the size of the engine, the same steam, used expansively, would do much more work, or the same work could be done with three-fourths of the fuel; and if, in addition to this, they will add 50 per cent. to their boilers, an additional saving will be made. Two instances have occurred to my knowledge within the last twelve months where a great saving has been made; the first engine had three plain cylinder boilers, 30 in. diameter and 26 ft. long. They were taken out, and three of the same diameter and 36 ft. long used. With the first set of boilers, the fires required a good deal of attention to make steam; the second set makes steam freely with two-thirds of the fuel;—no change was made in the engine. In the second case, the engine had four 30-inch boilers, 22 feet long; four 30-inch boilers, 40 feet long, were put in their place, and a cut-off valve applied to the engine. The consumption of fuel was reduced from $5\frac{1}{2}$ tons in 24 hours to $3\frac{1}{4}$ tons, and does nearly 10 per cent. more work. I will consider the other items of loss in your next.

W.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, February 21st, 1850.

Samuel V. Merrick, President, in the chair.

Thomas Fletcher, Vice President.

Isaac B. Garrigues, Recording Secretary.

The minutes of the last meeting were read and approved.

Donations were received from the Royal Irish Academy, Dublin; Wm. Jackson, Esq., Boston, Mass.; Wm. M. Wadly, Esq., Savannah, Ga.; the Young Men's Library Association, Cincinnati, Ohio; Thos. H. Forsyth, Esq. and Wm. H. Souder, Esq., Pennsylvania Legislature; Hon. Jos. R. Chandler, U. S. Congress; Charles E. Smith, Esq., A. B. Hutton, Esq., Dr. Wm. Pettit, Solomon W. Roberts, Esq., Major Hartman Bache, M. W. Baldwin, Esq., The Library Company of Philadelphia, and Prof. Jno. F. Frazer, Philadelphia.

The periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement of receipts and payments for the month of January.

The Board of Managers and the Standing Committees reported their minutes.

New candidates for membership in the Institute (6) were proposed, and those proposed at the last meeting (12) were elected members of the Institute.

The Standing Committees for the ensuing year were nominated and appointed as follows:

Library.

John Allen,
Dr. S. S. Brooks,
George Harding,
William S. Levering,
B. V. Marsh,
Daniel Rhoads,
William Roberts,
Jacob D. Sheble,
Charles E. Smith,
Dr. G. J. Zeigler.

Exhibitions.

John Agnew,
John E. Addicks,
John C. Cresson,
Owen Evans,
James P. Ellis,
Thomas Fletcher,
William D. Parrish,
John Wiegand,
C. A. Walborn,
Alan Wood.

Cabinet of Minerals and Geological Specimens.

James C. Booth,
Dr. M. H. Boyé,
John F. Frazer,
William P. Foulke,
Edwin Greble,
Dr. B. H. Rand,
R. C. Taylor,
A. W. Thompson,
Dr. L. Turnbull,
Dr. C. Wetherill.

Cabinet of Arts and Manufactures.

James C. Booth,
J. C. Copper,
James Euston,
C. M. Ghisky,
William Harris,
Dr. A. L. Kennedy,
William P. Troth,
G. L. Thomas,
Isaac S. Williams,
T. J. Weygandt.

Meteorology.

Samuel W. Black.
M. T. W. Chandler,
Emlen Cresson,
Dr. Charles M. Cresson,
Owen Evans,
James P. Ellis,
Dr. G. Emerson,
James S. Lippincott,
John Simmons,
Beaton Smith.

Meetings.

George Ashmead,
Joseph M. Cardeza,
B. B. Gumpert,
Dr. Henry Gibbons,
Dr. B. H. Rand,
George W. Smith,
Return Sheble,
James Swaim,
Dr. L. Turnbull,
R. A. Tilghman.

Cabinet of Models.

John Agnew,
A. L. Archambault,
H. P. M. Birkinbine,
J. J. Barras,
B. M. Feltwell,

Henry Huber, Jr.,
J. Vaughan Merrick,
Thomas S. Stewart,
Thomas U. Walter,
Thomas F. Williams.

Mr. Phleger explained the construction of a very powerful pump, used by the Corporation of the City, in relieving from water the excavation in progress in Walnut street, for the tunnel.

A specimen of Marble, with very large crystals, of great purity and whiteness of color, from the quarries 14 miles from the Baltimore and York Railroad, was exhibited.

Dr. Turnbull exhibited to the meeting specimens of the beautiful Red Zinc Ore of New Jersey, with the result of the most recent analysis, by Berthier, of a pure crystallized specimen, which contained 88 per cent. of oxide of zinc, and 12 of the red oxide of manganese. Some of this ore also contains iron, as it occurs with franklinite and calc spar at Franklin and Sterling, in New Jersey. Iron and manganese generally accompany it, and interfere effectually with its reduction into metallic zinc on a large scale.

He also exhibited specimens of the Oxide of Zinc, or Zinc Paint, which he remarked was known to the ancients as early as the time of Dioscorides. The first notice of a substitute for lead is found in the Elements of Chemistry of M. T. A. Chaptal, translated from the French by W. Nicholson, in April, 1791. At page 323, he remarks that M. De Morveau has substituted the precipitate of zinc for white lead with the greatest advantage. It answers perfectly the intention of the artist, and is not attended with any dangerous consequences in its use.

In the Elements of Chemistry of Andrew Fyfe, published in 1827, he says that the oxide of zinc is sometimes employed by painters, instead of white lead, in the preparation of their paint. Although it is more troublesome to work with, in other respects it is preferable to white lead, not being liable to become dark colored, nor does it prove injurious to the workmen.

It will be seen from the above quotations, that this is an old subject again brought forward very prominently by Mr. Leclair, a house painter of Paris, who has received the decoration of the Legion of Honor from the French Government. Its practical importance, both as regards public health and the use of an article so abundant, are the causes of bringing the subject before the Institute.

All the specimens of oxide of zinc prepared by precipitation and sublimation are unsatisfactory, being all inferior in color, and in the power of covering surfaces. Dr. T. exhibited two specimens upon wood and glass, remarking that one coat of pure lead in oil was fully equal to two of zinc. He also showed some carbonate, which is much whiter, and it has been suggested that the French method may be the same as that employed for white lead. He has, therefore, deputed a friend to bring several specimens from Paris, and obtain the requisite information in regard to its mode of preparation, which he will bring before the Institute on a future occasion.

Specimens of native Copper, from the north-west mines, Lake Superior, were exhibited. The Copper is of sufficient purity to allow of rolling without being previously smelted. A long and exceedingly thin ribbon, thus prepared, was presented for examination.

Mr. Smith, the Chairman of the Committee, exhibited a specimen of Faber's Magnetic Steam Gauge. The construction is as follows: A ball,

floating on the surface of the water in the boiler, when rising or falling, communicates motion to a piece of iron suspended on a pivot and moving in a vertical plane. A magnetic needle, moving in a similar plane, but on the outside of the boiler-head, follows, by its attraction, the bar of iron, and indicates its position in the boiler, and consequent height of the water. The advantage claimed is the dispensing with a rod passing through a stuffing box, thereby avoiding friction.

A Calculating Machine, by J. Wilhelm Mystrom, was exhibited and put into operation by the inventor. A description, unaccompanied by an engraving, would be unintelligible to our readers. We hope to furnish them with a full account of it hereafter in the Journal.

A Specimen Book of Fancy Printing, by O. H. Harpel, was exhibited.

The Chairman exhibited a drawing, made to a scale, of the great Suspension Bridge over the Ohio river, at Wheeling, on which the various heights of water were marked, as well as the heights of the steamboats navigating the river. The obstruction occasioned by it to the navigation of the river was referred to, and an account of the legal proceedings to abate the same were communicated to the meeting.

Photographic Portraits on Ivory, colored by hand, were exhibited by Mr. Langenheim of this city, and elicited much approbation.

Mr. Williams exhibited a Rotary Pump, to be used for air, steam, or water, resembling in its general features some of that large class already before the public,—the peculiarity in the movement of the cams by which the valves are adjusted was claimed as a novelty.

Drawings of the boiler which exploded during the present month, in Hague street, New York, causing the death of upwards of 70 persons, and razing a five-storied factory to the ground, was shown by Mr. B. H. Bartol, and the circumstances connected with the explosion were explained by him. The reader is referred to another part of this Journal, for a more full account of this *accident*. (?) A discussion ensued among the members respecting explosions in general and their causes. The supposition that gas formed in the interior of the boiler met with no advocates.

C. W. Bergner, No. 496 north Seventh street, presented for examination a number of samples of stuffs printed in Saxony.

Melsens' new method of making Sugar, in which the bisulphite of lime(?) is employed, was explained, and the possibility of extending it to the manufacture of wine, cider, and other fermented liquors, touched upon. Some discussion took place as to the chemical principles involved. The specimen of sugar made by this process, on a plantation in Louisiana, being the first specimen made on a working scale, had been procured by Mr. Bartol.

JOURNAL

OF

THE FRANKLIN INSTITUTE

OF THE STATE OF PENNSYLVANIA

FOR THE

PROMOTION OF THE MECHANIC ARTS.

APRIL, 1850.

CIVIL ENGINEERING.

Extracts from the Third Annual Report of the Directors of the Pennsylvania Railroad Company to the Stockholders, October 31, 1849.

In obedience to the 19th Section of the charter, the Directors of the Pennsylvania Railroad Company present to the Stockholders a statement of the affairs of the Company, for the fiscal year ending on Oct. 31, 1849.

The Report of the Treasurer, herewith submitted, states the amount received up to that date from subscriptions and other sources, to have been	\$3,622,035·00
And the amount disbursed,	3,123,364·71

Leaving a balance of	498,670·29
If to this balance be added the amount of uncollected subscriptions, including the second subscription from the City of Philadelphia, about	1,900,000·00

We have the sum of	\$2,398,670·29
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applicable to the construction and equipment of the road.

The report of Herman Haupt, Esq., Superintendent of Transportation, shows the earnings on the small section of the road in use to have exceeded the most sanguine anticipations, and embodies more cogent reasons for its immediate extension than could be adduced in any mere speculative argument as to its future profits.

The arrangement consummated with the Harrisburg, Portsmouth, Mount Joy, and Lancaster Railroad Company, has given the public more comfortable means of conveyance, and an increased rate of speed at a reduced cost, and will, it is hoped, result advantageously to the interests of both Companies.

With a view, as well to the accommodation of the citizens of our own State, as to the increase of revenue usually attendant on moderate charges, the Board have determined to reduce the fare for way travel, after the first of January, 1850, to the uniform rate of three cents per mile.

Extract from the Second Annual Report of the Chief Engineer.

PROGRESS OF THE ROAD.

The Road was opened on the 1st of September to Lewistown, 60 $\frac{2}{3}$ miles from Harrisburg, and has since been in uninterrupted use to that place. Owing to the unusual amount of sickness that has prevailed along the Juniata below Huntingdon, in consequence of the extreme low stage of water, the progress of the work above Lewistown has been greatly retarded, particularly upon the mechanical portions of it, which were almost wholly suspended during September and October, from the impossibility of procuring workmen. Since this region has again become healthy, the work has been resumed, and is being pressed with as much vigor as circumstances will permit. The long deep cut back of Newton Hamilton is nearly finished, and that two miles on this side of it, which was also retarded by the failure of the original contractors, will be through in January.

We entertain expectations of being able to reach Huntingdon in the spring, and feel no doubt but that we shall complete the whole of the Eastern Division in time for the ensuing fall trade.

A few miles above Huntingdon, the line enters the valley of the Little Juniata, which has always been free from the autumnal diseases that prevail on the lower portions of the stream, and in consequence, the work along it has progressed very satisfactorily, and will be ready in due time for the superstructure, for which materials are being delivered.

A portion of the grading of the Western Division, embracing fifteen of the heaviest sections along the valley of the Conemaugh, was placed under contract on the 12th ult., and a number of them have already been commenced. This work was let, to equalise the time of completion of that portion of the line east of the Southern Turnpike, and, if followed as proposed, by the letting of the remainder of the Division at the time stated, the whole road can be completed early in 1852.

Extracts from the Report of the Superintendent of Transportation.

RECEIPTS AND EXPENDITURES.

Receipts from passengers over Pennsylvania Railroad in September,	\$5,998-03
Receipts from passengers from Dillersville to Lewistown, in October, \$12,636-87	
Deduct proportion of receipts on Harrisburg and Lancaster Railroad, 4,835-70	
Received from passengers over Pennsylvania Railroad,	7,801-17
Receipts for eastward through freight,	538-42
“ “ way “	10-49
“ westward through “	444-01
“ “ way “	16-64
	<hr/> 1,003-56
Total receipts on Pennsylvania Railroad for September and October, . . .	14,802-76
Total expenses “ “ “ “ . . .	3,405-37
	<hr/>
Excess of receipts over expenses,	\$11,397-39

CAPITAL STOCK.

Graduation.

Cost of 60 $\frac{1}{2}$ miles from Harrisburg to Lewistown,	\$775,000
Present cost of superstructure,	580,000
	<hr/> \$1,355,000

Real Estate.

Damages and buildings,	85,000
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Equipment.

Passenger and freight cars,	12,500
Engines,	11,500
Shop, machinery, tools, &c.,	6,000
	<hr/> 30,000
Interest allowed on Stock paid in,	110,000

Total cost of road and equipment, \$1,580,000

From the preceding statements it appears that the excess of receipts over expenses, during the two months the road has been in operation, is \$11,397.39, equivalent to an average of 4 $\frac{1}{3}$ per cent. per annum, on the cost of road and equipment after paying all expenses.

The per centage for the month of September has been 3 $\frac{1}{8}$.
 “ “ October, “ 5 $\frac{1}{8}$.

When it is considered that the road is in operation only to Lewistown, a point at which it was not expected that the receipts would more than pay expenses, and that the business of transporting freight can scarcely be said to have commenced, the results thus far must be regarded as very encouraging.

Extract from the Second Annual Report of the Directors of the Ohio and Pennsylvania Railroad Company to the Stockholders, Jan. 10, 1850.

The amount of capital stock, though yet inadequate to the entire completion of the whole, was, however, deemed fully sufficient to authorize the Board in placing a large portion of the work under contract, which has accordingly been done from the mouth of Beaver to the Ohio State line, a distance of twenty-three miles; from a point near the intersection of the Cleveland and Wellsville road to Massillon, twenty-two miles, and five miles of the only difficult part of the route, near and eastward of the town of Wooster, an aggregate of fifty miles.

The line from Pittsburg to Big Beaver, 25 miles, is now nearly prepared for letting, and it is designed by the Board to place it under contract in season to commence work early in the Spring, and prepare it for the track within twelve months from the commencement of the work, together with the division from Beaver to the State line.

The subscriptions in Columbiana county yet fall short of the sum which the Board deem necessary to authorize it in placing the work in that county under contract; the assurances, however, recently given on that subject, justify the conclusion that the subscription will speedily reach the required sum, and that portion of the work proceed simultaneously with the Ohio river line, and closing the contracts continuously from Pittsburg to Massillon. Beyond that point, to the five miles letting near Wooster, hereto-

fore adverted to, the character of the work is so favorable that it can be readily completed in a very short period; true economy, therefore, would dictate a brief suspension of that interval of the road until the heavy jobs, near Wooster, have been for some months in progress, all of which can be completed simultaneously with the Eastern Division.

The contractors commenced work about the 1st of September last, and have been steadily prosecuting their respective contracts, several of which are nearly completed, and the whole line from Pittsburg to Wooster, 130 miles, may be prepared for the rails by the Spring of next year, notwithstanding, on one or two sections near the mouth of Beaver, the work has been suspended in consequence of the exorbitant demands for damages for the right of way. These obstacles will speedily be removed, either by compromise or legal adjudication, in season to recommence on the sections referred to early in the Spring, and completed simultaneously with that portion of the road now progressing. In the mean time the Company has sustained no loss by delay; on the contrary, it will be largely the gainer by the suspension, inasmuch as the most moderate computation of damages demanded for the roadway through section 25, at Beaver, would have amounted to \$17,000 or \$18,000, for which the owners are now willing, we understand, to take between \$4000 and \$5000.

You will have perceived, from the preceding remarks, that it is the design of your Board, should no unforeseen obstacles arise, to place under contract the whole line not heretofore let, between Pittsburg and Wooster, at a very early day, and prepare the road-bed for the rails, which it is believed, with adequate means, may all be accomplished within the present year, with the exception of a few heavy contracts to be completed in the following Spring. If the requisite funds are provided with sufficient promptitude, it is the opinion of the Chief Engineer that the whole line can be in use, and the trains running to Wooster in the autumn of 1851.

Where the undulations of the country require the line to deviate from a level, the grades in all cases are less than 50 feet to the mile, and there is no curve of a less radius than 1000 feet. From Wooster westward, by Loudonville and Mansfield, to the intersection with the Cleveland, Columbus, and Cincinnati Railroad, and the proposed point of junction with the Bellefontaine and Indiana Railroad, the distance will be about 50 miles, requiring no grade exceeding 26 feet per mile.

*Extracts from the Annual Report of the President and Managers of the
Beaver Meadow Railroad and Coal Co. to the Stockholders, Jan. 21, 1850.*

The mines of the Company have been worked the past year under contracts entered into with Hamberger & Co., and Cool & Lockhart, as mentioned in the last Annual Report. They have produced upwards of 74,000 tons of coal, which have been sent over the Company's road to Shipping Port, and sold at satisfactory prices.

The transporting power of the Company, consisting of 5 locomotive engines and 297 cars, was, by the terms of the contract with Wm. Milnes & Co., mentioned in the last report, placed in their possession to transport

the coal of the Company and the product of the Summit mines, of which they are the lessees, to Shipping Port.

Extract from the Engineer's Report.

The general character and working arrangements of the road are such, that, for convenience sake, I will allude to it in this report in three principal divisions, viz: the "Upper Division," extending from the mines to Weatherly, at the foot of the inclined planes, a distance of about six miles. The "Middle Division," extending from Weatherly to the Lehigh at Penn Haven, about five miles; and the "Lower Division," extending from Penn Haven to Mauch Chunk, about nine miles,—in all twenty miles.

Extract from Report of Secretary and Superintendent.

The amount of coal transported over the road is—

From Beaver Meadow,	73,702
Spring Mountain,	102,220
Hazleton Co.,	97,675
Cranberry,	40,498
Diamond Co.,	9,953
	<hr/> 324,048 tons.

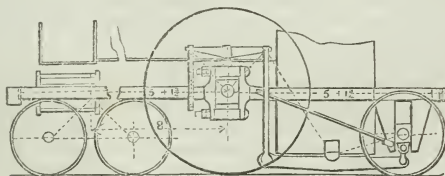
Being an increase over 1848, of	57,860 tons.
" " " 1847, of	76,548 "
" " " 1846, of	129,668 "
" " " 1845, of	175,048 "

Amount of tolls received from Spring Mountain, Hazleton, Cranberry, and Diamond Co's.	\$40,429-84
Received from sales of old iron, rope, and fines,	630-42
	<hr/>
Gross receipt from Railroad,	41,060-26
Amount expended on "	23,254-24
	<hr/>
Gain on Railroad,	\$17,806-02

*American Engineering—Locomotives.**

(Continued from page 155.)

We now give the sketch of the locomotive engine frame, referred to last month at page 154, as fig. 3. The dotted lines represent the manner in which the engine is balanced on its frame when only one pair of drivers



3-16th = 1 foot.

is used. The author of the article referred to states, that the engine from which the drawing was made works remarkably well, being quite steady

* From the Glasgow Practical Mechanic's Journal, for February, 1850.

and free from oscillation at a speed of 40 miles an hour, through curves which an English engineer would hardly like to pass through at a much slower rate. The details of construction will be readily understood on referring back to the remarks upon it in the March number.

*Dunn's Improved Mode of Removing Railway Carriages from one Line to Another.**

Railway turntables, for removing a carriage from one line of rails to another, are very expensive to lay down, very costly, and very apt to get out of repair; so that the wear and tear, as well as the first cost, is great. Mr. T. Dunn, of the Windsor Bridge Iron Works, Salford, has invented and patented an improved mode of effecting this removal, which dispenses with the circular disks or turntables, and works without turning the carriage at all.

At the point where carriages are required to be transferred from one line of rails to another, there is a grooved tramrail across the lines, and upon a level with them, upon which a sort of cradle traverses on four small wheels or runners. This is the patent traverser, which is usually from 12 to 15 feet in length, so as to receive a carriage of any ordinary length. Its sides would form two parallel rails, in continuation of the permanent ones on the line, but they are $2\frac{1}{2}$ inches above the level of the permanent rails. To each line of rails required is placed a lever, which, worked by hand, raises the adjacent length of both rails, at the end next the tramrail to the level of the traverser; so that this length of rail has thus given to it a temporary incline of $2\frac{1}{2}$ inches in 12 or 15 feet, a very easy gradient, and if by any accident the rail were left so, a train coming either way would be in no danger of being thrown off the line.

When the carriage, having ascended the slight incline, is placed on the traverser, it is there fastened by two buttons, and is then easily pushed along over the tramrails, crossing the rails at right angles, till it reaches the line upon which it is to be placed. The lever raises the rails here, the unfastened carriage descends the incline, and thus, without loss of time or change of direction, the carriage can be removed from any line to any other parallel line at a station.

The patentee states that the advantages of the patent traversers over those in ordinary use are, that there is no expensive gear attached, and they are not liable to get out of order; they are easily cleaned and oiled; the foundations are formed upon the simplest sleepers; the cross tramrails are upon a level with the permanent rails, leaving no break or recess whatever, and the roads are as firm and steady as the general line. The whole of the gear is simple, strong, and inexpensive, compared with others, and leaving considerable more room in a station than turntables, and at a saving of from 200 to 300 per cent. over turntables;—in some cases, of still more amount.

We understand that one of these trucks is now working ten lines of rails at the Peterborough station of the Eastern Counties Railway; another at the Salford station, Manchester; and one is working nine lines of rail on

* From the London Mining Journal.

the Paris and Lyons Railway. It has also been introduced at many smaller stations throughout the country; and the engineer and directors of the Lancashire and Yorkshire Railway Company have recently decided to work the chief stations at Liverpool and Bradford by two traversers, (each working four lines of road,) in preference to all other plans submitted. As the plan combines real improvement with great simplicity and a considerable saving, we think the subject of sufficient importance to give it all publicity. We believe the ingenious patentee means to exhibit a large model of his apparatus, with rails, carriage, &c., at the Exhibition of the World's Industry, in London, 1851.

Extracts from the Report of the President and Managers of the Philadelphia and Reading Railroad Company, and also a Report by David A. Neal, January 14, 1850.

RECEIPTS FOR THE YEAR.

Travel, 95,577 passengers, equal to 49,097 through passengers,	\$155,908-18
Freight, 51,204 tons merchandise,	106,346-86
“ 1097,761 19-20 tons coal,	1,648,900-46
United States Mail,	9,400-00
Miscellaneous receipts,	5,601-47
Hauling Cars and Valley Passenger Train to June 30th,	7,433-62
Total receipts,	\$1,933,590-59

The Road and its equipment are now equal to a business of 1,400,000 tons, (being an increase of 300,000 tons over that of the past year,) and no augmentation of the capital would be required for the transportation of that tonnage.

Business of the Road for the Year ending November 30, 1849.

TONNAGE.

Coal transported, tons of 2240 lbs.,	1,097,762
Merchandise transported, tons of 2000 lbs.,	51,204
Materials for use of Road, including earth, gravel, timber, rails, sills, cord-wood, stone, brick, iron, &c., &c., in tons of 2000 lbs.,	145,503
Total tonnage for the year, including weight of passengers, in tons of 2000 lbs.	1,429,564
Total amount of Coal transported to date, tons of 2240 lbs.,	6,387,445
Total tonnage of Road to date, tons of 2000 lbs.,	8,474,532

PASSENGER TRAVEL.

Total number of passengers during the year,	95,577
Total number of miles traveled by the same,	4,516,968
Equal to, in through passengers, over whole length of road,	49,097
Total number of passengers transported to date,	850,713

RECEIPTS OF ROAD.

From freight and tolls on coal,	\$1,648,900-46
“ freight on merchandise,	106,346-86
“ passenger travel,	155,908-18
“ transportation of U. S. Mail, express car, and other sources,	15,001-47
Total receipts,	\$1,926,156-97

Division of Expenses of Transportation Department for the Year ending Nov. 30, 1849.

Transportation of 1,097,762 tons of coal from coal region to Richmond, junction with State Road, and other points, at 43·62 cents per ton,	\$478,843·78
Expenses of transportation between junction with State Road and Company's Depôt in Philadelphia, including tolls paid State Road and City, hauling across Schuylkill Bridge, pay of Agents, &c.,	38,457·59
Transportation of 51,204 tons merchandize between Pottsville, Reading, and other points, and junction with State Road, at 82·4 cents per ton,	42,192·10
Transportation of 49,097 through passengers, between Pottsville and junction with State Road, at 66·5 cents per passenger,	32,649·50
Amount paid Contractors for passenger travel, from Dec. 1, '48, to April 30, '49,	7,881·39
Superintendence, including salaries of all officers, clerks, and coal agents at depôts,	22,168·07
Net expenses of delivering and sorting coal cars at Richmond wharves, between Trenton Railroad crossing and river Delaware,	7,778·48
Wages of all watchmen at wharves, depôts, and switches,	7,001·03
Expenses of delivering coal and freight, and hauling cars for all purposes at Reading and other depôts,	5,934·50
Office expenses, stationery, newspapers, advertising, &c.,	4,658·51
Expenses of sorting coal cars at Schuylkill Haven, for cars used on West Branch road,	7,587·58
Rent and expenses of Magnetic Telegraph,	2,564·23
Salaries of agents, and engine expenses on lateral railroads in the coal region,	2,467·98
Sundry expenses, express engines, rents, &c.,	6,771·97
Total,	\$666,956·71

Number of Engines, Cars, and Running Machinery upon the Road, November 30, 1849.

LOCOMOTIVE ENGINES.		COAL CARS.	
First class engines,	50	8-wheeled iron coal car,	1
Second class do.	25	4-wheeled do. do.	3019
Third class do.	8	Do. wooden do.	1603
Fourth class do.	3		
Total,	86	Total,	*4623
CARS FOR FREIGHT AND GENERAL USE.		PASSENGER CARS.	
8-wheeled covered house cars,	16	8-wheeled passenger cars,	21
Do. box cars,	43	4-wheeled do. do.	1
Do. open platform cars,	53	8-wheeled baggage do.	5
4-wheeled covered house cars,	128	4-wheeled do. do.	1
Do. open platform and box cars,	223	Do. express do.	2
Total,	463	Total,	30

In addition to the above, the Company own:—

- 2 Small Passenger Cars, for use of road.
- 9 Stationary Engines, from 8 to 35 horse power, for driving machinery.
- 10 Steam and Water Power Engines, for pumping at water stations, sawing wood, &c.
- 3 Portable Wood Cutting Steam Engines, at Port Carbon, Port Clinton, and Richmond.
- 7 Snow Ploughs.
- 15 Carts and Wagons, for hauling wood, &c., at Richmond and elsewhere.
- 37 Horses, for hauling in Philadelphia and Richmond.

Condensed Table Showing the Condition and Employment of all the Engines owned by the Company.

How Employed.	1st class.	2d class.	3d class.	4th class.	Total.
In daily use, in good order, on Reading or Lateral Roads,	32	16	3	2	53
In workshops, under repairs,	12	4	0	0	16
In good order, ready for use,	6	5	5	1	17
Totals,	50	25	8	3	86

Total number of miles run by all engines owned and used by the Company,
from May, 1838, to November 30, 1849, 6,676,301
Total number of tons hauled between same dates, 1,477,480,185

* 17 Wood Cars were altered into Coal Cars during the year.

EXTRACT FROM DAVID A. NEAL'S REPORT.

The Road extends from the edge of the coal formation in Schuylkill county, at Mount Carbon, one mile south of Pottsville, to the tide waters of the Delaware at Richmond, $3\frac{1}{2}$ miles above Philadelphia, and $104\frac{1}{2}$ from the sea.

It is composed of 51 planes,

18 of 39 miles length--level.

3 $6\frac{7}{10}$ " " descending 1— 5 ft. per mile.

14 22 " " " 5—10 "

6 $3\frac{4}{10}$ " " " 10—15 "

7 $15\frac{2}{10}$ " " " 15—20 "

3 4 " " " 20— $42\frac{7}{10}$ "

From the Schuylkill to the Delaware,

$3\frac{1}{10}$ miles length—ascending $33\frac{1}{2}$ "

From Mount Carbon to the Falls is 87 miles, total fall 549 feet. Between the Falls and Richmond, $6\frac{4}{10}$ miles, there is a rise of 61 and a fall of 104 feet. Total fall from Mount Carbon 592 feet. The Road has a double track its whole length, but only four feet apart, and of sideings and branch track to coal yards, $26\frac{9}{10}\frac{2}{10}\frac{0}{10}$ miles, independent of $7\frac{4}{10}\frac{4}{10}\frac{2}{10}\frac{0}{10}$ miles of track over the wharves at Richmond.

The rails in use are of 45, 52, 53, and 60 lbs. to the yard, being 3856 tons ($54\frac{1}{2}$ miles) of 45 lbs., which have been down 12 years; 3317 tons, or 11 miles, of 52 lbs. have been down 8 years; 777 tons, or $9\frac{1}{2}$ miles, of 53 lbs., 7 years, and 7992 tons, or 85 miles, of 60 lbs., from 1 to 6 years.

There are three tunnels of 962, 1600, and 1934 feet, excavated through solid rock, and arched for security from falling stone; and one under the Norristown Railroad of 172 feet.

On its whole length there are 18 stone, 9 iron, and 17 wooden bridges, over road, ravines, and water;—total length 8016 feet, of which 3693 feet are stone, 367 iron, and 3956 wood.

The others being permanent and requiring no repairs, the latter will be the only subjects of extraordinary expense. The bridge at Phoenixville, being new, will not require to be replaced for some years. The rest may probably be rebuilt from the fund provided for renewals, within the next six or seven years, of stone or wood, as may be deemed most expedient, without taking what may be required for other purposes.

The Reading Road connects directly with four lateral coal roads, to wit, at Mount Carbon, with the Mount Carbon Railroad, and the Mount Carbon and Port Carbon Railroad; at Schuylkill Haven with the Mine Hill or West Branch; and at Port Clinton with the Little Schuylkill. It also joins the Norristown Railroad at Corshehocken, and the State Road at the Falls,—the first 14 and the latter 4 miles from Philadelphia, and is thereby connected with that city. Indirectly it has other and very important connexions. The Mount Carbon Road runs $3\frac{1}{2}$ miles, and then makes out in two branches, $2\frac{1}{4}$ miles each. This road is operated by animal power, and communicates with the extensive works of the Delaware Coal Co., and four or five other mines, from which were received this year 132,769 tons of coal. It also discharged into canal boats, at Mount Carbon, 73,756 tons the past season.

The Mount Carbon and Port Carbon Railroad is only $2\frac{1}{2}$ miles in length. It has no mines of any consequence on its route, but is joined at Palo Alto by the Mill Creek Railroad, which continues $4\frac{1}{2}$ miles to St. Clair, and has two branches of $1\frac{1}{2}$ miles each, accommodating numerous collieries. It also connects with the Schuylkill Valley (or the Valley) Road, which is 9 miles in length to Tuscarora, and has 9 miles of branches to various mines. The motive power on these roads is furnished by the Reading Railroad, for which they now charge $\frac{3}{4}$ of a cent per mile, formerly $\frac{1}{2}$ cent. The Mount Carbon and Port Carbon Railroad is operated by the Reading Railroad by contract. A large distributing station at Palo Alto has about $3\frac{1}{2}$ miles of siding for this purpose, and facilities for weighing the coal. There are, also, a large engine house and commodious repair shops, which are for the use of the Reading Railroad.

The Reading Railroad received this year 140,672 tons of coal from the Mill Creek, and 192,566 from the Valley Road; and the canal has received from the same sources 103,945 and 111,845 tons respectively.

The Mine Hill or West Branch Railroad extends up the Valley $10\frac{1}{4}$ miles from Schuylkill Haven, which is 4 miles below Pottsville. This road has several branches, altogether 20 miles of track, and supplied to the railroad alone, in 1849, 483,526 tons, and to the canal, 135,262 tons.

At Port Clinton, 14 miles from Pottsville, and at the junction of the Schuylkill and Little Schuylkill Rivers, the Little Schuylkill Railroad comes in from Tamaqua, 20 miles, and with 4 miles of branches, supplying the Reading Railroad with 132,087 tons, and the canal with 36,563 tons, the past year.

Stations.—There are 33 stations on the road for the various accommodations and supplies required by the passenger, freight, and coal trains, besides the extensive one at Port Carbon, and the establishment in Broad street, Philadelphia.

Of these stations, the most important are Port Carbon, Mount Carbon, Schuylkill Haven, and Port Clinton, as receiving depôts for coal; Reading and Pottstown as the sites of extensive repair shops; and Richmond as the great shipping point for all the coal not taken by the way and Philadelphia trade. All the rest are used either for passengers, freight, or wood and water depôts for the several trains. The larger ones are each under the direction of an agent, who does all the work by contract,—a system that has been introduced the past year, and which, it is believed, will be productive of considerable saving as soon as its details become well understood.

The station at Port Carbon has very extensive sideings for the distribution of the coal cars for the Mill Creek and Valley Roads, there being laid down for this purpose over $3\frac{1}{2}$ miles of track. At Mount Carbon, the Company's grounds are extremely limited, but as the trains, except from the Pottsville Road, are made up at Port Carbon, there is less difficulty in making the arrangements than might be supposed. At Schuylkill Haven and Port Clinton, there are also sideings for making up the trains, but not so extensive as the business sometimes requires. At the former place, particularly, it is supposed a considerable annual saving could be made by a mile or two more of track.

At Reading, the Company owns a large tract (28 acres) of ground, a

short distance from the town, on which they have a convenient freight house. In the south part of the town they have five acres more, on which are their manufacturing and repair shops. These are necessarily on a large scale, but nevertheless inadequate to do the work in the best manner. The buildings have been put up at different times, and their locations are inconvenient, both in regard to each other and the work to be done in them. They have been much crowded with machinery, but are now better arranged than at the commencement of the year. These shops contain every species of machine used in the manufacture and repair of locomotives and cars,—some of it very ingenious, useful, and perfect of its kind. That lately introduced for the sawing, planing, and mortising of wood, will reduce very materially the expense of making and repairing the wooden coal cars, and, with some improvements lately adopted in their construction, make them preferable hereafter, on the score of economy, to those of iron. There are now employed in these shops, in the repair of engines and cars, about 350 men and 30 boys, against 376 men and 30 boys last year.

Trip Hammer Shop.—This establishment, including building, machinery, engine, three steam hammers, and furnaces, cost \$17,128.45. The policy of this outlay, at a time when every dollar expended cost the Company, in discount, commissions, or extra interest, nearly two, was at least questionable. But, being finished, it is put to good use in converting the old materials that are turned in at better prices than could be otherwise realized, into shafts, axles, tyres, and bar iron, for the use of the road and machinery, and which, at current rates, would seem to show a profit to the Company. It is possible that this establishment could be leased on terms that would make it still more advantageous.

The Foundry, including building, 2 cupolas, fans, power, cranes, &c., cost \$4708, and must be considered a profitable establishment, if the car wheels and other castings made here prove, as they now appear to be, good. It saves all scrap castings, or rather receives them at one cent per pound, and turns out chilled tender and car wheels, and other articles of cast iron, at about $1\frac{5}{16}$ cents per pound, being a saving of nearly one-half over purchasing them in the market. The adoption of a new process in casting spoke wheels, by which they are made with solid hubs, will also save a large sum in fitting them.

At Pottstown are the principal shops for the repairs of the track and bridges, and an extensive building for housing cars, &c.

At Richmond there is a large engine house and machine shop for common repairs. This is also the shipping point for all coal going by sea or canal from the railroad.

There are 14 wharves, capable of holding 120,000 tons of coal, and having berths for 90 sail of vessels, which may all be loading at one time, either by means of shutes or barrows.

The distribution of these wharves among the several dealers and operators has been, and may continue to be, a matter of great consideration and difficulty. Heretofore no charge has been made for the use of them. They are covered by a platform supported by trestle work, on which are laid the rails for the coal cars that are placed there by engines devoted to that duty. They deposit their loads either by *dumping* them upon the wharf below or through shutes into the holds of vessels. No more complete es-

tablishment can be imagined. It is capable of shipping, with good management on the part of the holders of the wharves, at least 1,500,000 tons, and the Company own enough of water front here to build six more wharves, that would bring up the capacity to 2,500,000 tons. The most that has been shipped is 838,000 tons, but 956,000 have been received there in one year.

The number of men employed in the above workshops has been reduced from 711 in June, 1848, to 493 in November, 1849, and their monthly wages from \$22,191 to \$15,600.

The relations of the Reading with the lateral roads are of the most friendly character. With the Mount Carbon and Port Carbon there is an existing contract which expires next May, by which the Reading Railroad Company have the use of the tracks, engine house, machine shop, weighing apparatus, and office, for which they pay the sum of \$10,000 per annum, and, in addition, operate the road, which is kept in repair by the Mount Carbon and Port Carbon Railroad Company. The Valley and the Mill Creek are also worked by the Reading—formerly at $\frac{1}{2}$, and since April last at $\frac{3}{4}$ of a cent per ton per mile. This is probably about the actual expense.

The Reading Railroad supplies cars for all the coal brought upon their road from the lateral roads without charge. The Canal Company do the same. This carries a heavy expense, which is included in the account of repairs of coal cars, though it does not properly belong to the cost of working the Reading Road.

The Report of the Engineer shows precisely the engines and cars used on the road, and their present state, the amount of transportation, the cost of operating the road, and the net results.

It will be seen that 1,047,000 miles were run by engines passing about 1,100,000 tons of coal, 50,000 passengers, and 50,000 tons of merchandise, producing a gross income of nearly two millions of dollars, and requiring an expenditure of about half that amount, thus showing the magnitude of its business and the necessity of continual watchfulness over it.

The charge for the use of the State Road from the Falls to Broad street, in Philadelphia, amounts to \$27,000 annually, while, from the nature of the accommodation, little or no saving is effected in its transportation. As the State is about to abandon the use of this part of the road, it may, perhaps, be obtained for a reasonable consideration. If not, the City business may be abandoned to the canal, which could well afford to offer for it some other equivalent.

The State demands a tax on dividends of 5 per cent., when the dividends amount to 6 per cent. on the capital, otherwise a tax on the road.

But the great drain, it is hoped, has ceased. Enormous rates of interest, bonds sold at half their nominal value, commissions, brokerages, and similar charges, ought to be no more heard of forever in the annals of the Reading Railroad.

But the road, *i. e.* the bridges, the rails, the engines, and the cars, must be perpetuated, and that has been provided for by a Renewal Fund that will effect its object. For a few years, till the wooden bridges can be replaced with stone, it may all be consumed within the year. Beyond seven years, it will be a constantly increasing fund. The bridges being all of a

permanent material, the present charge for sustaining and watching them will be dispensed with, thereby diminishing by so much the current expenditure.

This railroad derives its resources from the coal fields of Schuylkill county, which now send to market more than all the other anthracite regions put together, and are capable of producing much more than there is likely to be any market for for many years, if not ages, to come. The supply there is limited only by the demand—the demand will be regulated by the relative facilities in the different regions for working the mines and conveying the coal to market. The anthracite coal capable of being worked is found in this country only in the State of Pennsylvania. The Lehigh region affords the hardest, and, for many purposes, the best. Its outlet is through the Lehigh canal and river 60 miles to Easton, thence through the Delaware division of the Pennsylvania canals to Bristol, 60 more, thence by the Delaware to Bordentown, 10 miles, then by the Delaware and Raritan Canal, 43 miles to New Brunswick, whence it is taken to New York, 29 miles.

Instead, however, of passing the Delaware division, it may pass the Delaware at Easton, to the Morris Canal, and by that canal 90 miles to Jersey City. On this route it is restricted, too, by the size of the boats, and still more by the unfinished state of the inclined planes, by which these boats are carried from one level to another, instead of locks. The boats on this canal are of 70 tons burthen, but the planes will not allow their passage with more than 50 at present. The Lehigh Canal sent forward by the above routes, in 1848, 680,193, and in 1849, 800,197 tons of coal. The cost of transportation to New York, including tolls, is about \$2.40 per ton. The coal fields of the Lehigh connect with those of the Schuylkill at Tamaqua, near which place is the dividing summit between the Delaware and Schuylkill rivers. From this point, it is said, tolerable grades may be found for a railroad along the valley of the Mahanoy and Lehigh to Easton, 60 miles. It would, however, come in competition with the Lehigh Navigation, which is capable of doing the whole business of that region, and it must, of course, be up-hill work to take the trade of the Schuylkill Valley. Between Easton and Somerville, an elevation of about 600 feet is to be overcome, and nothing better than 22 feet grades against the down trade can be anticipated. It is evident that a vast outlay will be required for such a work, and if it were made, it is quite doubtful whether it will affect the Reading Railroad unfavorably or otherwise. A sufficiently healthy competition may be maintained by enlarging the canals already in use, and by the facilities of mining enjoyed by the powerful companies operating in this district.

The Lackawana region lies north of the Lehigh, and has its only outlet by means of the Delaware and Hudson Canal at Honesdale, to the Hudson river at Rondout, 109 miles, where is the established depôt. Thence to New York it is transported by the Company, at a freight of 50 cents per ton. The cost of transportation on this route is merged in the price of the coal, which is fixed annually by the Delaware and Hudson Canal Co. The receipts at tide water of this description, this year, have been 454,240 tons against 434,267 tons in 1848. The canal, which will only admit

boats of 50 tons, will be enlarged, and the supply from this region will undoubtedly increase.

The coal of the Schuylkill has two outlets, in the Railroad and the Schuylkill Navigation. By the former, the freight and tolls to tide water at Richmond have averaged, the past year, about 30 cents per ton more than by the latter to the wharves on the Schuylkill. The difference is esteemed to be a fair compensation for the superior advantages of the former over the latter mode of conveyance. Such are the only sources of supply for this particular description of coal, with the exception of some small quantities that reach the Susquehanna from the Wyoming, Pine Grove, Shamokin, and Lykens Valley mines. The mines in the Schuylkill Valley can deliver coal at Mount Carbon at \$1.25 to \$1.50 per ton; freight per railroad \$1.50 to \$1.80; its cost at tide water from \$2.75 to \$3.30.

But the anthracite is liable to competition from other descriptions, both domestic and foreign—more especially from the Cumberland and Susquehanna of the former, and the Pictou and Sidney of the latter character. The Cumberland and Susquehanna can probably be delivered at tide water at about \$3 to \$3.50 per ton, but at points whence freight by sea will be higher than from New York or Philadelphia.

The cost of the road stands at an alarming figure—over sixteen millions for less than one hundred miles of railroad is enough to deter many from investing, even at a great discount. It is still more to be feared, if this sum has been expended, not in making the road, but in raising the means to make it. Nevertheless there is another view of this matter. The facilities of its easy and uniform grades, that are not to be found on any other road of equal length, the advantages of its location, occupying, as it does, all the available space in the valley it passes through, and the abundance of its resources for business that can never fail, and may be extended at pleasure, are perhaps a full equivalent, though they are no reasons, for this large expenditure. Its ability of transporting great masses with comparatively little power is one that cannot be bought with money. The Reading, it is believed, does carry over it a larger amount of tonnage than any other existing railroad, and at less expense. It is probably destined to form part of the communication between Philadelphia and the great Lakes, if not with the West, and it affords at all seasons the means of furnishing supplies to the large population of a very fertile and wealthy country on the banks of the Schuylkill, and in the coal regions beyond. It will have rivals. There will be rival producers and rival carriers. The cost of working and the rates of leave for taking coal must be, if they have not already been, brought down to a point that will be an average of other business. Coal lands are of no value if they are not operated. Their owners will take half a loaf rather than no bread. The mines that are expensive will be dropped, and those only in favorable locations continue to be worked. These will be found in all the coal regions, and will tend to reduce the price of coal to the consumer, and thereby increase the consumption. This is not a competition that the transporters need fear. It is not great prices but great quantities that such railroads as the Reading want. The chance of a great rivalry is less probable among the carriers. Great avenues can be constructed, as experience shows, only at enormous outlays and with doubtful results. The Corporations that have constructed

them heretofore have all become bankrupt, and there would seem to be no inducement for seeking the same end by the same means. Insane speculators there always will be, but they seldom take a beaten path to ruin. They have too much self-esteem to follow others.

AMERICAN PATENTS.

List of American Patents which issued in September, 1849, with Exemplifications by
CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

Continued from page 180.

26. For an *Improvement in Atmospheric Churn Dashers*; William M. Wright, Pittsburg, Pennsylvania, September 11.

The patentee says,—“My invention consists in constructing a hand-dasher in such a manner that it will operate as an air pump, to force a stream of air into the cream at the same time that it agitates it, while being raised and lowered in the act of pumping.”

Claim.—“What I claim as my invention, is the combination of the loose plunger with the tubular dasher, the same being made, arranged, and operated as set forth, or in any other substantially similar manner.”

27. For an *Improvement in Cars for Dumping Earth, &c.*; Michael Berncy, Syracuse, Onondaga county, New York, September 11.

The patentee says,—“The nature of my invention consists in providing dumping cars with rockers and cleaves, in such a manner that the bodies of the cars may be easily overturned, and their contents discharged, and at the same time allowing the body to be placed upon the frame at a less distance from the ground than in earth cars heretofore in use.”

Claim.—“What I claim as my invention, is the combination of the rocker and cleaves with the double car body, substantially as described, and for the purpose set forth.”

28. For an *Improvement in Horse Powers*; William Ward, Zanesville, Muskingum county, Ohio, September 11.

The patentee says,—“The nature of my improvements consists especially in the arrangement and combination of a rotary compound accelerative wheel with its hollow shaft and pinion, by which the power and motion of the master wheel is communicated directly to the pinion of the line shaft from two points diametrically opposite, and independent of, each other.”

Claim.—“What I claim as my invention, is the combination of the compound wheel with the pinions N N, and beveled cog wheels R R; cogged wheel H with the propelling pinions F I, the pinion Q of the line shaft P, and driving or master wheel A; the whole arranged and operated in the manner set forth.”

29. For an *Improvement in Pumps for Raising Water*; John B. Read, Tuscaloosa, Tuscaloosa county, Alabama, September 11.

The patentee says,—“My improvements consist in forming the upper part of the pump chamber of a trumpet-shape, so that the piston, when raised somewhat higher than its usual working limit, may enter this enlarged part of the pump chamber, and be sufficiently loose therein to allow any water above it to pass freely below it or on its outside; also in attaching the lower valve, which is to be spherical, to the lower part of the piston by some flexible connexion, as a small metallic chain; the chain to be of such a length that the lower valve may be raised from its seat whenever the piston is elevated into the enlarged part of the pump chamber, as mentioned above; thus allowing a free passage into the well for any water above the piston, and affording the means of withdrawing the lower valve from the pump, along with the piston, and the upper valve attached to the piston in any of the ordinary modes, whenever it may be necessary for repairs or any other purpose.”

Claim.—“What I claim as my invention, and as an improvement in atmospheric and lifting pumps, is the connexion of the lower valve with the piston, in combination with the trumpet-shape of the upper part of the pump chamber, so that, when the piston is elevated

higher than usual, the water above the piston may return into the well, and the piston rod and both valves be withdrawn from the pump and replaced together when necessary, as described."

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30. For an *Improvement in Cooking Ranges*; Philip Rollhaus, City of New York, September 11.

The patentee says,—“The nature of this invention and improvement consists in arranging the ovens of the range on either side of the fire chamber, and providing the same with inclined diving flues at their sides, and inclined ascending flues at their back parts, communicating at their lower ends with horizontal flues beneath the ovens, in such a manner as to conduct the heat over the tops, down the sides, below the ovens, and up behind their back parts; said flues being inclined in such relation to each other as to partially break the draft or current of the heat and smoke in its route, and cause it to enlarge its volume beneath the ovens; and also in arranging diagonal plates and dampers above the ovens, for causing the heat to pass directly from the fire chamber into the chimney when desired.”

Claim.—“What I claim as my invention, is the arrangement of the inclined flues at the sides of the ovens, and inclined flues at the back parts of the same, in combination with the diagonal plates, and the dampers, for either causing the heat to pass directly from the fire chamber into the chimney, or over the tops, and down the sides, and, after enlarging its volume below, up behind the ovens, as set forth.”

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31. For *Improvements in Machines for Dressing Shingles*; Franklin Jenney, New Bedford, Bristol county, Massachusetts, September 18.

Claim.—“What I claim as my invention, is the combination of the following elements: 1st, the inferior or stationary inclined bed; 2d, the elevator; 3d, the stationary plane or knife F; 4th, the pressure roller N; 5th, the movable carriage and its ways; 6th, the superior or reversed inclined bed, having an angular inclination to a horizontal plane of double that of the stationary bed; 7th, the plane or knife G; 8th, the spring catch-bar; 9th, the pressure roller R; the whole being arranged and made to operate together substantially in the manner as specified.”

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32. For an *Improved Machine for Making Brooms*; James Thomas, West Chester, Chester county, Pennsylvania, September 18.

The patentee says,—“My invention consists of three separate sets of gripes or lever presses, which act independently of each other, and by which the handle is firmly supported, and the brush pressed and securely held upon the handle during the operation of winding the wire which binds the brush to the handle.”

Claim.—“What I claim as my invention, is the use of two or more sets of jaws, made and arranged substantially in the manner and for the purpose herein set forth, for compressing the broom brush, and holding it on the broom handle, during the process of wiring the broom.”

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33. For an *Improvement in Flues for Cooking Stoves*; Henry Bleecker, Albany, New York, September 18.

The patentee says,—“The improvement in which my invention consists, is the manner in which the conveying flues are reverted into the return flue in the chamber at the front of the stove.”

Claim.—“What I claim as my invention, is the reverting chamber formed by the angular plate K and plate H, under the front of the bottom of the oven, as herein set forth, when this is combined with the flues formed by the plates B and C, as described.”

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34. For an *Improvement in Cooking Stoves*; William Wheeler, Troy, New York, September 18.

The patentee says,—“The nature of my invention consists in the mode of constructing the fire chamber, grate, and ash-pit, and in combining two ovens therewith, by which I can economize heat, and can cook a great variety within the ordinary space allotted to the purpose.”

Claim.—“What I claim as new, is, 1st, the contracted opening in which the fire grate is situated, extending down through the bottom of the stove, in part under the grate, and permitting the ovens to be enlarged at that point through which the ashes is discharged and air

supplied for combustion, and forming a heated chamber, by which a greater heat is given to the oven quite to the bottom of the stove.

"2d, I claim the fire-arch plates, with their overhanging projections or ledges forming diagonal channels, so constructed as to prevent clogging with ashes, and admitting air on the sides, as set forth.

"3d, I claim the combination of the grate and its frame, constructed substantially as described, having an angular depression on the upper surface of the grate, and a segmental curvature on the under side, combined with the fire-arch as set forth, and with the connecting bars placed within the ends of the cross-bars of the grate to complete the draft.

"4th, The combination of the air-passage with the centre fire-arch and oven flues, substantially in the manner and for the purpose described."

35. For an *Improvement in Cooking Stoves*; William Sours, Mount Jackson, Shenandoah county, Virginia, September 18.

The patentee says,—“The invention consists in the arrangement of the flues and their course around the oven; it is for the purpose of more equally distributing heat than has heretofore been, with a convenient mode of construction.”

Claim.—“What I claim as new, is the arrangement and direction of the flue, in combination with a fire chamber the whole size of the top of the stove, the flues forming the first part of the course being made a part of the walls of said chamber.”

36. For an *Improvement in Cooking Stoves*; Elias Kané, Camden, Camden county, New Jersey, September 18.

The patentee says,—“The purposes of my invention are to cause the draft to pass directly from the fire chamber around the oven, and thence out of the exit pipe, without any return flue, the fire chamber being situated in the upper part of the stove in front, and the exit pipe in the rear end of the stove at top.”

Claim.—“What I claim as new, is the combination of the flues, substantially as described, so as to cause the draft to pass around the oven the whole breadth on their sides, and thence along side flues, on top to the exit pipe, through the triangular flue in the rear.

“I also claim, in combination therewith, the fire chamber with a grated back, by which I effect an economy of heat by exposing a larger portion of the ignited fuel to the chamber over the oven.”

37. For a *Signal for Privies*; J. H. Doughty, City of New York, September 18.

The patentee says,—“The nature of my invention consists in the arrangement of a signal on a privy, in combination with a bolt for fastening the door on the inside, so that the act of fastening the door with the bolt raises the signal in a cupola on the top of the privy, and gives notice to persons outside that it is occupied.”

Claim.—“I claim the combination of the signal with the bolt of the door of the privy, to operate the signal in the manner set forth, by the bolting and unbolting of the door.”

38. For an *Improved Fire Arm with several Stationary Barrels and a Revolving Hammer*; George Leonard, Jr., Shrewsbury, Worcester county, Massachusetts, September 18.

The patentee says,—“The general ideas embraced in the improvement, machine, or instrument, in combination with several connected barrels, is a lock; by the ordinary motion of a trigger, the hammer is made to revolve and give repeated strokes in proper positions to explode the charges of the several barrels; the barrels and stock of the gun, carbine, or pistol, in the mean time, are fixed and permanent; they have no motion necessarily connected with the explosion, but remain unchanged in situation.”

Claim.—“What I claim as my invention, is a fire arm with the following essential elements: several fixed barrels and a revolving hammer. The successive discharge of the barrels is effected by the hammer, and the whole is constructed substantially as herein described, but irrespective of the positions of the cones, of the form or position of the hammer, or of the mechanical devices by which the revolution of the hammer is effected or the stroke given.”

39. For an *Improvement in the Land-Side of Ploughs*; Abraham Christ, Unity, Columbiana county, Ohio, September 18.

Claim.—“What I claim as new, is diminishing the bearing of the land-side upon the bottom of the furrow, and thus lessening its friction, by inclining at least one half of its lower

edge, on the rear end, slightly upwards, but not so abruptly as to prevent it from resting throughout its entire length against the land-side of the furrow, to sustain the pressure of the furrow slice against the mould-board, and maintain an equal balance of the plough."

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40. For an *Improvement in Machinery for Riving and Dressing Shingles*; Enoch R. Morrison, Angelica, Alleghany county, New York, September 18.

The patentee says,—“The nature of my invention consists in the application of a single revolving wheel furnished with knives, by which the shingle is riven and shaved, to a stationary block or case in which it is shaved and jointed; the various operations performed by the revolution of the wheel being, first, riving the bolt; second, shaving and tapering the face of the shingle; and third, jointing its edges.”

Claim.—“What I claim as my invention, is effecting the several operations of riving the bolt, and shaving and jointing shingles, by a single revolving wheel, made and arranged substantially in the manner described.”

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41. For an *Improvement in Rotary Churn Dashers*; Lewis W. Colver, St. Louis, Missouri, September 18.

The patentee says,—“The nature of my invention consists in giving the beaters of a churn dasher a revolving motion on their own axis.”

Claim.—“What I claim as my invention, is making the beaters of revolving churn dashers to turn upon their own axes, substantially in the manner and for the purpose set forth.”

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42. For an *Improvement in Rotary Churn Dashers*; D. N. Egbert, Hudson, Summit county, Ohio, September 18.

The patentee says,—“The nature of my invention consists in making the floats of the revolving dashers hollow, and fitting them with pistons to which motion is imparted by eccentrics, in such manner that the air drawn in during the ascent of the floats is forcibly ejected beneath the surface of the liquid.”

Claim.—“What I claim as my invention, is the combinations of the pistons, moved by stationary eccentrics, with the floats of a revolving dasher, in the manner and for the purpose herein set forth.”

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43. For *Improvements in Couplings for Cars*; Joseph D. Alvord, Springfield, Hampden county, Massachusetts, September 18.

The capacity of the machine for self-adjustment, by the laws of gravitation and the collateral aid of the spring, if necessary, in its application to railroad cars, the ease and certainty by which a separation can be produced by the lever attached, and the advantage of the immediate disconnection that would follow, in case of an accident by which one car should be thrown off the track and down an embankment, are important improvements and principles claimed by the inventor.

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44. For an *Improvement in Gas Generators*; Albert Woodhull and Charles Minturn, City of New York, assignees of John Watson and Edward Cart, Hull, England, September 18.

The patentees say,—“The first of these improvements consists in so constructing the retort furnace that it can receive the whole charge of fuel required to generate a given quantity of gas. And also the regulating the draft of air to the fire, and the escape of heat therefrom, so that the rate at which the fuel is to be consumed will be such as to prolong the combustion over a period of time equal to that for which the gas generated by it is to be used.

“And secondly, combining the gas-holder with the pipe or channel which conveys the material for making gas to the retorts, by a throttle-valve, stop-cock, or like contrivance, so that the quantity of materials fed will be in ratio to the gas at any time used.”

Claim.—“What we claim as our invention, is so constructing the retort furnace that it can receive the whole charge of fuel required for a single operation, and so managing the combustion of the fuel, by setting the controlling dampers, that it shall cover the space of time usually allotted to the consumption of the gas by the burners, when this arrangement of furnace and damper is combined with the gas-holder that controls the feed to the retort, and supplies the same according to the consumption of the burners, as set forth and described herein.”

45. For *Improvements in Couplings for Cars*; H. L. B. Lewis, City of New York, September 18.

Claim.—"What I claim as my invention, is the connecting railroad cars by a joint formed by the combination of the head pieces with the cylindrical piece, the joint being held together by the link and pins; the whole constructed and arranged in the manner described."

46. For an *Improvement in Frames for Stretching Canvas*; Henry Bryant, Hartford, Connecticut, September 25.

The patentee says,—"My improvement consists in making the frame without mortise or tenon, by simply cutting the ends of the four parts of the frame to a mitre, and bringing the parts together so as to form right angles at each corner, and securing them in that position by metallic plates, held in their proper positions by binding screws inserted through slots in each of the limbs of the plates."

Claim.—"What I claim as my invention, is the method of constructing the frame without mortise or tenon, by cutting the corners to a mitre and securing them by metallic plates, by means of binding screws inserted through slots, so that the corners may be forced outward by means of four wedges or keys, when the whole is constructed substantially as herein described."

46. For *Improvements in the Spinning Jack*; Foster Nowell, Lowell, Middlesex county, Massachusetts, September 25.

Claim.—"What I claim as my invention, is driving the carriage spindle forward and back by means of a mangle wheel, on which the teeth are arranged in a circular position, and securing the quick and slow motion of said carriage by alternately driving the mangle shaft with gears of equal size, and with gears greater or less disproportioned to each other.

"I also claim stopping the movement of the carriage when it is out, so that the requisite twist may be put into the yarn by throwing, from time to time, the pulley (on the main shaft, and from which the mangle shaft derives its motion) out of connexion with said shaft by the clutch, operated substantially as described.

"I also claim effecting the 'backing-off' of the yarn from the spindles, or reversing the action of the race belt shaft, from time to time, by means of a suspended box or frame containing the self-adjusting stud, operated or pressed down by the revolving arm on the mangle shaft, and having a hook, which, as said box descends, engages with and turns the ratchet on said race belt shaft, the same being substantially as described.

"I also claim changing or varying the transverse movement of the coping or faller wire by the double ratchet, operated as described, the screw rod and chain connected to the shaft which holds the coping wire; the whole being combined and operating substantially as set forth."

47. For an *Improved Door Lock*; Edwin B. Horn, Boston, Massachusetts, September 25.

Claim.—"What I claim, is one or more concentric depressing tubes, as combined with the series of tumblers and internal or permanent key, and made to operate therewith, and by means of the external key, substantially as described.

"I also claim the mode of making the internal key, viz., with the socket in the shank, and the movable bit and spring applied to the said socket; the whole being substantially in manner and for the purpose as set forth.

"I also claim the indented or concentric wheel tube, and its gear or turning mechanism, in combination with the series of (or one or more) concentric depression tubes, and its and their tumblers, substantially in manner and for the purpose as specified; the said wheel tube being constructed with one or more recesses or notches, for the reception of the projection of its tumblers, under the circumstances and for the purpose as described.

"I also claim the head or socket plate, in combination with the fixed key-shank, and the series of concentric depressing tubes, substantially as specified; the same serving to cover and protect the ends of the concentric tubes, and to lock or connect the permanent and movable keys together, so as to enable the latter to turn the former, all as explained."

48. For an *Improvement in the Motion of Riddles in Winnowing Machines*; Alexander Moffitt, East Bethlehem, Washington county, Pennsylvania, September 25.

The patentee says,—"My invention consists in a peculiar combination of the crank, humpers, radius-bars, and suspension-straps, whereby a combined reciprocating shocking motion

is communicated to the shoe, the shocks being produced by the striking of the shoe alternately at its top and bottom against bumpers attached to the frame of the fanning mill, by which arrangement the cleaning of the grain is more efficiently performed."

Claim.—"What I claim as my invention, is oscillating the shoe diagonally, by means of the bumper, substantially in the manner and for the purpose set forth."

49. For an *Improvement in Paring and Coring Fruit*; Peter W. Hardwick, Wayne county, Indiana, September 25.

Claim.—"What I claim as my invention, is the projecting hollow tube core-cutter, in combination with the lever-arm, in the manner and for the purpose described."

50. For an *Improvement in Suspender Buckles*; Sheldon S. Hartzhorn, Naugatuck, New Haven county, Connecticut, September 25.

Claim.—"What I claim as my invention, is constructing a buckle or fastener for suspenders, and other purposes, of a front plate, a spring with two eyes or places to hold the tongues or pins, and the tongues or pins made of one piece bent to the shape, substantially as shown, when the whole is arranged, connected, and combined, substantially as described."

51. For an *Improved Form of the Air Chamber of Life Boats*; James D. Greene, Cambridge, Middlesex county, Massachusetts, September 25.

The patentee says,—"My improvement consists of a peculiar construction or extension of each of the said air chambers, whereby I am enabled, with respect to the common mode of making such air chambers, to obtain more buoyant power, and, in consequence thereof, a greater elevation of the centre of gravity of the boat above the plane or line of flotation, whenever the said boat may be thrown bottom upwards."

Claim.—"My invention, and that which I claim, consists in the peculiar enlargement or mode of making each of the decks or upper parts of the air chamber at the bow and stern, each being constructed with a reversed inclination or depression towards the nose of the bow or stern, and an elevation of base high above the gunwale, as represented in the drawings, and as differing from the mode heretofore practised, and substantially delineated on said drawings by dotted lines; the said improvement in the bow and stern air chambers enabling me to obtain advantages as above stated, as well as many others not herein enumerated."

52. For an *Improvement in Cauls for Veneering*; Hazard Knowles, City of Washington D. C., September 25.

Claim.—"What I claim as my invention, is the method described of interposing between the veneer and the screw, or other device, by which it is compressed into contact with the surface on which it is required to glue it, a stratum of some elastic substance thick enough to be readily compressible into the cavities, and to allow the protuberances of the surface to penetrate into its mass, whereby a sufficient pressure is exerted upon every part of the veneer, bringing it into close contact with the surfaces of all the inequalities of the ground, and effectually expressing the surplus glue from between them."

53. For an *Improvement in the Mode of Applying Springs in Timepieces*; Levi Beach, Bristol, Hartford county, Connecticut, September 25.

The patentee says,—"My improvement consists in so constructing the movement that two wheels, propelled by springs, may operate on opposite sides of the main pinion, in such a manner as to essentially reduce the friction, (which is very considerable when *one* spring, sufficient to move the work for eight days with a dead beat and lever, is used,) and so that one of the springs may be exerting its full force while the other is being wound up, thus operating as a maintaining power in the most efficient manner."

Claim.—"What I claim as my invention, is the using of two driving wheels, propelled by two springs, and so arranged as to exert their driving force on opposite sides of the main pinion, to lessen the friction, to communicate a uniform motion, and to supply a sufficient maintaining power while each spring is being wound up, for what are called 'Eight Day Marine Timepieces,' when the whole is constructed and arranged substantially as described."

54. For an *Improvement in Springs for Chairs*; Thomas E. Warren, Troy, New York, September 25.

The patentee says,—“The nature of my invention consists in the using of the plates in a reverse position from that adopted in ordinary elliptic springs, by which I am enabled to firmly affix both ends of each and every leaf of which the spring is composed, and at the same time prevent them from wearing, by entirely separating them from each other, excepting where they may be fastened, and not allowing them to slide over any rest or stationary part of the carriage or other object which they are used to sustain.”

Claim.—“What I claim as new, is the employment of two or more sets of bow-shaped or other regular curved leaves, substantially such as herein described, being made of metal of the same thickness and breadth throughout, or nearly so, and firmly attached by their ends or bearings to the boxes or other fixture by which they are held in place, each leaf composing said springs working separate from the others, as above specified, and firmly fastened at their ends or bearings, as applied to chairs or other similar purposes, as described and represented.”

55. For an *Improvement in Dentists' Forceps*; Edward Bourne, New Bedford, Bristol county, Massachusetts, September 25.

The patentee says,—“The nature of my invention consists in combining flexible jaws with the forceps, attached to a fulcrum rest-bar, whereby the instrument is made and adapted to pull different sizes of teeth with great facility, in a straight direction.”

Claim.—“I claim the combination of the flexible jaws with the forceps, in the manner substantially described, for the purpose set forth.”

56. For an *Improvement in Self-Acting Cheese Presses*; Samuel Mann, Alstead, Cheshire county, New Hampshire, September 25.

Claim.—“What I claim as my invention, is the employment or application of the rollers in connexion with the levers, the rollers being suspended between the follower-board and the cheese-board by means of the cords, ropes, chains, or other suitable suspenders, substantially in the manner and for the purpose set forth; thereby not merely giving pressure to the cheese, but pressing it with a gradually increasing degree of pressure, as the follower-board and the cheese-board, with the cheese between them, descend along the standards.”

57. For an *Improvement in Seed Planters*; James P. Ross, Lewisburg, Union county, Pennsylvania, September 25.

The patentee says,—“My improvements in the construction of the seed drill are, 1st, the mode of regulating the quantity of seed to be dropped; 2d, the apparatus for regulating the depth of the drills; and lastly, the method of bracing the beams to which the hollow teeth are affixed, so as to keep them steadily in place, and allow them freedom of motion to vibrate up and down.”

Claim.—“What I claim as new, is, 1st, the combination of the carrying wheel and shaft, substantially as described, by means of the spur-gear and crown-wheel, with a lateral motion, by which the quantity of seed sown can be exactly regulated.

“2d, I claim the adjustable gauge for regulating the depth to which the seed shall be sown, and for the other purposes named, covering and depressing the earth over the seeds.

“3d, I claim the mode of securing the parallel motion of all the teeth laterally, by means of the diagonal braces, all as herein fully set forth.”

58. For *Improvements in Machinery for Jointing Staves*; Hosea and Lorenzo D. Benson, Jackson, Susquehanna county, Pennsylvania, September 25.

The patentees say,—“The nature of our invention consists in providing two planes with unequal faces, and coupling said planes together on a movable gate, to set the planes at different angles to one another, and in operating the said planes by a reciprocating motion, to plane the joints of staves of any bulge, and any bevel on the edge,—the one plane shaving in one direction, and the other plane shaving in the other direction, cutting both ways of the reciprocating motion; and also planing off the rough and smoothing by the construction of each plane.”

Claim.—“We claim the combination of the two planes with the guide-rails and the gauge, to set the planes at different angles, to joint staves of different bulges, the planes answering the purpose of a face plate, and the one plane shaving in one direction, and the other shaving in an opposite direction, in the manner described, or in any manner substantially the same.

"We also claim the planes constructed with the faces in each plane, in combination with the supports on the planes, to shave off the rough and smooth or finish the jointing by one set of planes, in the manner substantially as set forth."

59. For an *Improvement in Attaching Hooks and Eyes to Cards*; Charles Atwood, Birmingham, New Haven county, Connecticut, September 25.

The patentee says,—“The nature of my invention consists in fastening them by perforations through the paper, and by embossing it so as to show almost the whole form of the hook on the face of the card, and in such manner that it will not recede, not permit the eye, when appended to the hook, to escape from it.”

Claim.—“What I claim as my invention, is the fastening of hooks and eyes to the cards in the manner set forth: that is, by means of suitable perforations, and crimping, folding, or doubling of the cards or paper, thereby dispensing with the use of thread and much labor.”

60. For an *Improvement in Shower Baths*; Jeremiah Essex, Bennington, Bennington county, Vermont, September 25.

The patentee says,—“The nature of my invention consists in providing an apparatus having the convenient attachments for a warm shower, cold shower, and vapor baths in one, and the whole being convenient for operation by the person using the bath, and for his changing from one to the other at pleasure; the whole being effected with very trifling cost over that of the common shower bath.”

Claim.—“What I claim as of my own invention, is the manner of arranging the pump, cistern, lamp, and steam tube, as set forth, substantially in the manner and for the purpose described.”

61. For an *Improvement in Making Dissected Maps*; Samuel M'Cleary and John Pierce, Hoosick, Rensselaer county, New York, September 25.

The patentees say,—“The nature of our invention consists in forming a set of steel or other suitable metallic dies, exactly corresponding in number and form with the towns, counties, states, or whatever division it may be desirable to make in the map or chart, and the wood or paper, or other material, being fitted to a proper thickness and surface by pressure, is split or cut off with each of the dies, and these several pieces or sections, when properly arranged, will exactly fit together and form a whole or complete map or chart.”

Claim.—“What we claim as our invention, is our mode of making dissected maps; the same consisting in cutting the sections with the grain of the wood by suitably prepared dies, the paper with the inscriptions and representations being pasted upon the wood before the sections are cut; all above specified and for the purposes herein mentioned.”

62. For an *Apparatus for Opening and Closing Blinds*; Cheney Reed and Elias Howe, Jr., Cambridgeport, Middlesex county, Massachusetts, September 25.

Claim.—“What we claim as our invention, is the apparatus described for opening and closing blinds from the interior of the house, without opening the sashes; said apparatus consisting of a horizontal slotted arm, fastened to, and projecting from, the blind, and a lever arm cast on, and projecting at right angles from, a sliding and turning rod passed through the window frame, as described.”

63. For an *Improvement in the Construction of Grain Carriers*; Adam Linhart and Saml. M'Clain, Fulton, Stark county, Ohio, September 25.

Claim.—“What we claim as our invention, is the mode of constructing the wire belt or straw carrier, as described and represented.”

64. For an *Improvement in Devices for Sowing Seed in Grain Drills*; Pierpont Seymour, East Bloomfield, Ontario county, New York, September 25.

The patentee says,—“The nature of this invention consists in arranging immediately below the seed or grain box of the machine, two horizontal parallel plates, forming the bottom of said box, connected together by links, and provided with a lever for moving one nearer to, or farther from, the other, in order to regulate the quantity of seed or grain passing between the same, and placing beneath said plates a horizontal vibrating bar, having pins on its upper surface, extending through the space between the plates, and connected to a vibrating plate

or bar attached to springs, and provided with an anti-friction roller at its extremity, pressing against a zig-zag plate or wheel secured to the driving wheel of the drill, in such a manner as to cause said bar under the box, and its attachments, to be moved to and fro during the progress of the machine, and the pins to agitate the seed or grain next the space between the plates, and cause the same to pass through said space and descend between angular blocks, which conduct it into the leather tubes, from whence it passes through the drill teeth; and also in attaching the drill teeth to a windlass arranged at the back part of the machine, and operated by a lever, in such a manner as to enable the operator to raise all the drill teeth from the ground at the same time, by simply raising said lever, and otherwise improving the machine to better adapt it to the purposes for which it is designed."

Claim.—"What I claim as my invention, is the combination of the springs attached to the vibrating bar or plate, to which the anti-friction roller is attached, zig-zag plate or wheel, and vibrating bar having teeth on its upper surface, for facilitating the passage of the seed or grain through the space between the parallel plates, as described."

RE-ISSUES FOR SEPTEMBER, 1849.

1. For a *Machine for Breaking Coal*; Joseph Battin, Philadelphia, Pennsylvania; patented October 6, 1843; additional improvement annexed January 20, 1844; re-issued September 4, 1849. (Patent of February 12, 1844, also surrendered.)

Claim.—"What I claim as my invention, is the arrangement of the teeth on the two rollers, substantially as described, so that, in their rotation, the teeth of one shall come opposite the teeth of the other, with sufficient space between to hold lumps of the required size, the rollers being so combined by gearing as to make them rotate in opposite directions, and with the required velocities to retain the relative position of the teeth of the two rollers, as described."

2. For an *Improvement in Looms for Weaving Carpets and other Figured Fabrics*; Erastus B. Bigelow, Clintonville, Worcester county, Massachusetts; patented May 16, 1842; ante dated May 1, 1842; re-issued September 11, 1849.

Claim.—"What I claim as new, is, 1st, in connexion with the power loom, depressing one trap-board, or more, whilst the other, or corresponding trap-board or boards, is elevated, substantially as described.

"2d, I claim placing and working the journals above the trap-boards, substantially in the manner and for the purpose specified.

"3d, I claim working the card prism of the jacquard by a cam, or the equivalent thereof, connected with the loom or deriving motion therefrom, and whilst the trap-boards are at rest, substantially as described.

"4th, I claim regulating the delivery or giving out of the warps, by the tension of the warps or chain acting on a vibrating roller, or the equivalent thereof, in combination with a regular and positive take-up motion for taking up the woven cloth, substantially as described.

"5th, I claim the employment of a series of shuttle-boxes and a receiving shuttle-box on each side of the loom, and supported in a separate and independent frame by the side of the loom, substantially as described.

"And lastly, I claim stopping the loom when a change of colors is required, by combining the shipper, or the equivalent thereof, with the jacquard, substantially as described."

3. For an *Improvement in Brussels Looms*; Erastus B. Bigelow, Boston, Massachusetts; patented March 20, 1847, re-issued September 11, 1849.

Claim.—"What I claim as my invention, is, 1st, giving to the two parts of the mechanism,—that which weaves the cloth and forms the body of the fabric, and the one which operates the figuring wires,—a separate and distinct organization, substantially as described, when these are connected and combined by an intermediate mechanism which shifts the motive or driving power from one to the other, substantially as described. And, in combination with this, I claim also the employment of the two brakes to arrest the momentum of the moving parts, to prevent any conflict in the operations of the two parts of the mechanism.

"2d, I claim, in combination with a loom for weaving such looped fabrics as herein designated, the employment of a box, trough, or the equivalent thereof, for receiving and holding the figuring wires preparatory to their being introduced under the figuring warps, substantially as described.

"3d, I claim the fingers, or their equivalents, which receive the figuring wires from under the pile or figuring loops, in combination with the box, trough, or the equivalent thereof, into

which they are deposited preparatory to the introduction of them under the figuring warps, substantially as described.

"4th, I claim, in combination with the mechanism which withdraws the figuring wires from under the pile or figuring loops, the fingers, or their equivalent, for transferring the said wires to the trough, or the equivalent thereof, from which, or by which, they are transferred to the open shed of the figuring warps, substantially as described.

"5th, I claim the method, substantially as described, of introducing and dropping the figuring wires in the open shed of the figuring warps, as described.

"And finally, I claim the method, substantially as described, of supporting the figuring wires in the open shed of the figuring warps, when they are being introduced, as described."

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4. For an *Improvement in Power Looms*; Erastus B. Bigelow, Clintonville, Worcester county, Massachusetts; patented August 18, 1846; anté dated February 18, 1846; re-issued September 25, 1849.

Claim.—"What I claim as my invention, is, 1st, combining with the lay of a power loom, and on each side thereof, two cams and two rollers, or their equivalents, one of said cams for working the lay, and the other for holding it in a stationary position during the throw of the shuttle, substantially in the manner and for the purpose specified.

"2d, The employment of two series of shifting shuttle-boxes on one or both sides of the lay, hung and operated in separate and independent frames on each side of the lay of the loom, the said boxes being shifted and otherwise operated by machinery receiving motion from the loom, or from some first or other mover working in unison with the power loom, substantially as described and for the purpose specified.

"3d, Combining with the shipper, for stopping the loom when the shuttle fails to pass through, or the equivalent thereof, a protector for each series of shifting shuttle-boxes, hung in separate frames independent of the lay, substantially as described and for the purpose specified.

"And lastly, in combination with the lay of the loom, and shuttle-boxes hung in separate frames independent of the lay, the employment of jointed guides, substantially as described, for guiding the shuttles in their passage from the shuttle-boxes to the lay, and *vice versa*, and which yield to prevent breaking when the shuttle fails to pass entirely through, substantially as described."

DESIGNS FOR SEPTEMBER, 1849.

1. For a *Design for a Portable Grate*; A. C. Barstow & Co., assignees of Apollos Richmond, Providence, Rhode Island, September 11.

Claim.—"What I claim as my invention or production, is the combination of ornaments on the three-sided frame and blower forming the front of a portable grate, consisting of the swelled moulding, with sunken ovals and circles, the cross panel, gothic panel, and pilaster, on the said frame, and the similar gothic panels on the blower, all as described and represented in the accompanying plate of drawings."

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2. For a *Design for Stoves*; James Wager, Troy, New York, September 25.
 3. For a *Design for Stoves*; James Wager, Troy, New York, September 25.
 4. For a *Design for Stoves*; John M. French, assignee of Calvin Fulton, Rochester, New York, September 25.

The claim to each of the above patents is for the designs as represented in the specifications.

List of American Patents which issued in October, 1849, with Exemplifications by CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

1. For an *Improved Self-Acting Waste Gate or Shuice*; Ambrose Torrey, Boston, Erie county, New York, October 2.

The patentee says,—"The nature of my invention consists in providing a waste gate for mill ponds, canals, reservoirs, and all places where it may be used advantageously, which turns on a horizontal axis, and is opened and shut by the action of the water as it rises and falls."

Claim.—"What I claim as my invention, is a waste gate which revolves on a horizontal axis placed nearer the bottom than the top of the gate, which is opened and shut by the action of the water, and whose motion is restricted by appropriate stops; the whole constructed and operating substantially as described."

2. For an *Improvement in Portable Copying Presses*; Henry M. Paine, Worcester, Massachusetts, October 2.

Claim.—"What I claim as my invention, is the curved form of the bed and platen plates, as described."

3. For an *Improvement in Machinery for Spinning Flax, &c.*; Charles Clark, West Troy, Albany county, New York, October 2.

The patentee says,—"The nature of my invention consists in providing what I term a balance frame, suspended below, and combined with, the bobbin or taking-up shaft, to operate the taking-up bobbin by an intermittent motion, so as to make the bobbin wind on the spun yarn with the same regularity and tautness, whether there be little or much yarn on the taking-up bobbin; also to give the flax, &c., two twists during one revolution of the flyer."

Claim.—"I claim the balance frame, constructed substantially as described, and suspended on the axles of the flyer. I also claim the combination of the eccentric with the rocker, the balance frame, the guide bar, the regulating bar, the ratchet lever, and the ratchet rods, and the ratchet wheel on the spindle which moves the bobbin, to move the said bobbin, in the manner substantially as herein described."

4. For an *Improvement in Couplings for Cars*; Warren D. Hatch, Worcester, Massachusetts, October 2.

The patentee says,—"The nature of my invention consists in a spring tongue, which, when the coupling link is withdrawn, prevents a guided coupling-pin from entering the space in which the coupling link is to be inserted, and which, when the latter is introduced, gives before it and allows the pin to enter and secure the link."

Claim.—"What I claim as my invention, is the combination of a spring tongue with the self-acting guided coupling-pin, arranged substantially in the manner and for the purpose set forth."

5. For an *Improvement in Varying the Speed of the Mandril in Lathes*; Wm. A. Chapin, Jr., St. Johnsbury, Caledonia county, Vermont, October 2.

Claim.—"What I claim as my invention, is the combination of gears fixed to the cone of pulleys, and made to revolve with and by them, the two gears affixed upon a shaft or axle extended or projected from the mandril, a gear affixed on a tubular shaft, through which the mandril extends, and in which it turns, and the tubular shaft; the whole being applied to the mandril and cone of pulleys, and made to operate in connexion therewith, substantially in manner and for the purpose as specified."

6. For an *Improvement in Machinery for Raising Water from Wells*; Jehial T. Farrand and William Hinman, Port Byron, Cayuga county, New York, October 2.

Claim.—"What we claim as our invention, is the catching and retaining the sliding plate in its proper position whilst a full bucket is being elevated in a well, and detaching the sliding plate at the moment that the bucket is emptied, to allow the position of the plate to be changed, for the purpose of reversing the motion of the buckets, by means of the combination of the lugs projecting from the side of the sliding plate, and the arms projecting from the shafts, arranged by the ascent and descent of the buckets, substantially in the manner set forth."

"We also claim the manner of upsetting the buckets and discharging their contents, by means of rods that connect the lifting bails of the buckets to the ends of the chain, and the tilting bails, combined with the rods and with the buckets, and operated by the forks at the ends of the levers, substantially as set forth."

7. For an *Improved Composition for Metallic Packing in Steam Engines*; Green S. Cox, Barbour county, Alabama, October 2.

The patentee says,—"The nature of my invention consists in a composition of the follow-

ing metals, to wit, lead, tin, zinc, and antimony, for the purpose of forming a steam-tight packing that is less liable to wear than packing now in use."

Claim.—"What I claim as my invention, is the application of the composition, as above described, for the purpose of packing steam engines."

8. For an *Improvement in Carding Machines*; Daniel W. Hayden, Windham, Windham county, Connecticut, October 2.

The patentee says,—"The nature of my invention consists in the application to the carding engine in common use, of several rotating cylinders or top cards, and a frame of vibrating cards or combs, by means of which vibrating cards or combs the said revolving top cards or cylinders are constantly and uniformly stripped, the strippings being deposited in contiguous boxes or troughs for removal, thus presenting continually clean surfaces of the said top cards to the main card cylinder, and producing a uniform delivery of work, and causing the machine to deliver a more uniform sliver or strand continually and uninterruptedly; the several cards being so arranged that they can be adjusted with great exactness, without any danger of the teeth or the additional or top cards touching the teeth of the main cylinder and vibrating cards."

Claim.—"What I claim as my invention, is the employment of the cylindrical top cards, in combination with the vibrating strippers and the main cylinder, the parts being arranged and operated substantially as set forth."

9. For an *Improvement in Apparatus for Making Mould Candles*; Andrew L. Brown, New Haven, Connecticut, October 2.

The patentee says,—"My improvement consists in constructing the mould with a thread or screw on the upper part, about two inches from the end, for adjusting and securing it in the frame, and a shoulder near the upper end, to support the tallow table, and a hole to admit the wire which supports the wick.

"And attaching all the wires which support the wicks, to a slide worked by a jointed wire handle, and governed by a guard, so that all the wicks may be evened by one motion of the hand, and then be all centred at another motion.

"And in using a smooth end movable tallow table, level with the tops of the moulds, by which means the surplus tallow may be easily scraped off, and the whole kept clean."

Claim.—"What I claim as my invention, is the use of the slide with the wires to sustain the wicks, attached in such a manner that I am able to even and centre the wicks, and, when the tallow has cooled, to entirely withdraw the wires from the candles, each by a single motion of the slide of only about one-half of the diameter of the candle, as described.

"And I also claim the combination of the use of the mould made with an adjusting thread or screw below the end, the shoulder on which the tallow table rests, and a hole for the wire, with the slide and movable tallow table; when the whole is constructed and combined substantially as described."

10. For a *Process for Making Steel*; Norman M. Isham and Erastus E. Marcy, Hartford, Connecticut, October 2; anté dated November 2, 1848.

Claim.—"What we claim as our invention, is the process described of manufacturing steel by producing, first, a metal imperfectly converted in the cupola furnace, in the manner described, and then submitting said metal to the refinery, constructed as described, wherein the article is perfected by the means made known. 2d, we claim the horizontal blast in the refining furnace, as stated, for blowing a blast of carbonic oxide, as set forth."

11. For an *Improved Foot-Valve of Steam Engines*; S. W. Rogers, Baltimore, Maryland, October 2.

Claim.—"What I claim as my invention, is constructing the entry valve of a pump which draws water from a condenser, of less specific gravity than water, and arranging it, substantially in the manner set forth, beneath the valve-seat, against which it is supported by the water in the valve-chest, so that when the pump piston is withdrawn in the barrel, and the water in the valve-chest recedes from the valve, the latter, being unsupported, will fall and allow the water in the condenser to flow into the pump through the opening in the valve-seat; but when the water fills the valve-chest, the valve, being lighter than the water, will float upwards and close the opening."

12. For an *Improvement in the Mode of Operating Brakes for Cars*; Nehemiah Hodge, North Adams, Berkshire county, Massachusetts, October 2.

The patentee says,—“My invention consists in so connecting the brakes of the two trucks of a car that the brakeman, in operating upon either set, shall bring both sets down upon their respective wheels at once, and cause each set to act with the same amount of force as it would if disconnected from the other; the arrangement of the several parts being such that it can be conveniently applied to the ordinary brakes in general use.”

Claim.—“What I claim, therefore, as my invention, is the peculiar manner, herein described, of arranging the levers and connecting rods, in combination with the brakes, so as to apply both sets of brakes with equal force by working either brake wheel.”

13. For an *Improved Arrangement of the Conductors in Centrifugal Gold Washers*; Lemuel P. Jenks, Boston, Massachusetts, October 2.

Claim.—“What I claim as of my own invention in the above contrivance, is the arrangement of conductors, (on the inner surface of a revolving metallic or other containing vessel,) overlapping each other, thus permitting the particles to be subjected to the action of the water in their passage from one conductor to another.”

14. For an *Improvement in Adjustable Churn Dashers*; Thomas G. Clinton, George H. and Edward H. Knight, Cincinnati, Ohio, October 2.

The patentees say,—“The nature of our invention consists in so constructing and arranging concave beaters, rotating vertically, that the level of the milk may rise above, or fall below, the axis of motion to a very great degree, and still have air distributed there, through by the beaters, in quantities equal to their capacity for holding the same.”

Claim.—“What we claim as new, is making adjustable to any desired angle the concave beater, rotating vertically in the process of churning, and thus extending the pneumatic action incident to its concavity to any quantity of milk; the surface of which, and the face of the beaters, can be made to meet in the same plane, as described.”

15. For an *Improvement in Machines for Making Washboards*; William B. Stewart, Cincinnati, Ohio, October 2.

The patentee says,—“The nature of my invention consists in nailing, by pressure upon the nails when properly located and fixed for the purposes desired, any one portion of any article (such as washboards, common boxes, &c.) to any other portion of the same article, whether done by the precise mechanical arrangement described, or done by any other analogous device.”

Claim.—“What I claim as new, is driving, by pressure and simultaneously, the series of nails necessary to attach one part of a washboard, box, or other article, to another part of the same as the case may be, by means of the combination of machinery as described, or any equivalent device, viz., the blocks *m*, with their series of drivers, and the blocks *l*, with their series of nail boxes or mortises, springs, and cylindrical guide openings; the blocks *l* forming, to this extent, a portion of the apparatus for nailing by pressure.”

“I claim the combination of the apparatus for driving nails by pressure, as described, with the clamp, and the blocks *l*, acting as clamps on the article to be nailed by, to the drivers.

“I claim the combination of machinery, as described, viz., the pressure blocks *l*, in their distinct and separate capacity as such, the table, bed, and clamp, by which the crimped and edge-sharpened sheet metal is made to incise the wood, and by which, in addition thereto, the legs and body board of a washboard are put and held in suitable juxtaposition for the operation of the drivers, whether the combination of machinery, as described, be operated by levers, toggle, and treadle, as described, or by any equivalent devices.

“And lastly, I claim the combinations of machinery, viz., the blocks *m*, drivers, blocks *l*, mortises, springs, guide openings, ways, table, bed, and clamp by which I clamp, incise and clamp, and nail, in the order described, the several parts of a washboard, as described, or a box or other similar article, whether operated by levers, toggles, and treadles, as described, or by other equivalent power.”

16. For *Improvements in Sewing Machines*; Sherburn C. Blodgett, Georgetown, Essex county, and John A. Lerow, Boston, Massachusetts, October 2.

Claim.—“What we claim as our invention in the above described rotary sewing machine, is arranging the shuttle that carries the filling thread, so that it shall revolve horizontally in

a circular shuttle race, said shuttle being constructed with a curved front and pointed nose, which shall travel in a circular guiding groove sunk below the bottom of said race, so that the shuttle shall invariably pass through the loop formed by the needle-thread, all as herein above set forth.

"We also claim the pad or washer under the spring arms which carry the shuttle, for keeping the filling thread straight as explained. Furthermore, we claim the arrangement of the wide spring and bent lever spring, operating as described, or any contrivance substantially equivalent thereto, for relaxing the needle-thread when the loop is to be formed, and holding it rigidly when each stitch is to be tightened, as set forth.

"We also claim the converging nipper springs, through which the needle, &c., passes, to keep the thread up, and prevent the needle from splitting or breaking it, as set forth."

17. For *Improvements in Machinery for Mitre Sawing*; Dennis S. Stow, Cohoes, Albany county, New York, October 2.

Claim.—"I claim the arrangement of circular saws or cutters, revolving vertically, secured to a bed or block having a horizontal circular motion, the saws or cutters being fitted to arbors moving freely backward and forward in the direction of their axes, this motion of the axes being governed by guide-bars attached to blocks capable of being shifted to any angle with the line of the direction of the stuff to be operated on, these blocks being attached to the moving carriage for the said stuff, and the guide-bars operating in grooved pulleys on the axes of the said saws or cutters, keeping them (the saws and cutters) operating in a line parallel with said bars, the result of which is, that, as the stuff to be sawed, with the carriage on which it is placed, advances on the machine, the movement of the saw is in the diagonal line indicated by the direction of the guide-bar, and the cutting of the material conformable thereto, so that at whatever angle the bar is placed with the direction of the material operated on, at such angle will the saw cut it.

"I claim the combination of mechanical apparatus in the above specification set forth, by which oblique-angled joints, tenons, or work of a similar character can be done, operating, if desired, upon both the ends of a piece of stuff at once, and making, in that case, similar or dissimilar joints or cuts at the two ends at one operation."

18. For a *Removable Water Lining for the Fire-Boxes of Steam Boilers*; John J. De Haven, Reading, Berks county, Pennsylvania, October 2.

The patentee says,—"My invention consists in the application of a removable water lining, either in separate sections or united, so as to form a complete false fire-box, for the purpose of protecting the main boiler from the intensity of the fire."

Claim.—"What I claim as my invention, is a removable sectional or continuous water lining, or false fire-box, made and arranged substantially in the manner and for the purpose herein set forth."

19. For an *Improved Machine for Filing Circular Saws*; Israel F. Brown, Columbus, Muscogee county, Georgia, October 2.

The patentee says,—"The nature of this invention and improvement consists in securing the saw to be filed between disks, at the upper extremity of a vertical shaft turning in boxes in a suitable frame, and arranging above said disks and saw an inclined traversing frame, operated by connecting rods and cranks, and attaching to said traversing frame two vibrating adjustable levers, having angular files secured at one end, immediately over the saw, and suspended alternately, by spiral springs at their opposite ends, to a cross-bar secured to the traversing frame, and combining with the same other appurtenances, in such a manner as to cause said files to be forced back and forth over the saw, and alternately with the reversion of the same, to file and sharpen the tangential edges of its teeth."

Claim.—"What I claim as my invention, is the combination of the adjustable collars with the adjustable rectangular timbers or blocks, for regulating the up and down play of the levers and files, and moving them to either side as occasion may require, as described; thus adapting the machine to various sized saws."

20. For an *Improvement in Boot Crimps*; Eli R. Horner and William Holland, Fayetteville, Franklin county, Pennsylvania, October 2.

The patentees say,—"Our invention consists in a combination of adjustable clamps, with sheaths for the tree, by which arrangement the leather is drawn down to the tree both lengthways and cross-ways, without risk of cracking or tearing."

Claim.—"What we claim as our invention, is the combination of the top and toe blocks, and their respective sheaths, with the leg, heel, and foot clamps; the whole arranged substantially in the manner and for the purpose herein set forth."

21. For an *Improvement in Gold Washers*; Louis Lacharme, St. Leger de Feugeret, France, October 2.

The patentee says,—"My invention is designed to perform three distinct operations on the mineral or earthy material containing gold: first, to separate the fine and coarse gold particles, as well as the fine and coarse earthy materials, from each other; second, to amalgamate completely the fine gold; and thirdly, to wash and separate the coarse particles of gold, without the necessity of amalgamating them."

Claim.—"What I claim as my invention, is the combination of the perforated screen with the ore and water leader and the jet tube, whereby the materials capable of passing through the holes of the screen are at once separated from the coarse gold and gravel, and the meshes of the screen are kept perfectly clear.

"I also claim the agitator, with its fingers so constructed and operating that they can have only an alternating motion, in combination with the cistern, whereby the coarse particles of gold are separated from coarse sand and other materials, while a current of water is flowing over them, in the manner herein set forth.

"I also claim the arrangement, in a single machine, of the revolving screen, and the amalgamator, the fingers, and the cistern, whereby the washing and amalgamating of gold in fine particles is performed simultaneously and at one operation with the washing and separating of coarse gold from sand and gravel, with amalgamation, in the manner and for the purposes substantially as herein set forth."

22. For an *Improvement in Portable Ovens*; Calvin Doane, Wareham, Plymouth county, Massachusetts, October 9.

Claim.—"What I claim as my invention, is the combination with the back of a common cylindrical air tight stove of an oven frame, and a portable trapezoidal oven, susceptible of being hinged to, or unhinged from, said frame, as set forth."

23. For an *Improvement in Water Wheels*; William G. Masterson, Amesbury, Essex county, Massachusetts, October 9.

The patentee says,—"My improvement consists in passing the water round the wheel any given number of times, in a horizontal direction, the water descending from one level to another at the termination of each revolution, and being made to pass through any given number of contractions, which I call buckets, in its course, by which means I keep the water in a solid body without breaking before it makes its exit from the wheel, and cause it to press with the four sides of its column on said buckets, by which I attain the full force of the water upon the wheel while passing through it."

Claim.—"What I claim as new, is forming the water courses of a series of horizontal flanches, with inclined openings for communication, as described, and with contractions or buckets placed at intervals in said compartments, substantially in the manner and for the purpose set forth."

24. For an *Improved Jointed Centre-Board*; Thomas Maskell, Franklin, St. Mary's parish, Louisiana, October 9.

Claim.—"I therefore claim a jointed centre-board, constructed substantially as described, having its two ends connected with the false keel, into which it is recessed, and its centre portions jointed and connected with a rod that passes up into the vessel, by which it can be worked up and down, in the manner and for the purposes set forth."

25. For an *Improvement in Cooking Stoves*; James Leffel, Springfield, Clark county, Ohio, October 9.

Claim.—"What I claim as new, is extending the front diving flues along under the hearth plate, aside and in front of the ash pan, and thence down in front of the oven plate, thus forming there an open flue, when the oven is extended under the hearth plate, in the manner and for the purpose described."

26. For an *Improvement in Hydraulic Presses for Cotton, &c.*; Charles Wilson, Williamsburg, Kings county, New York, October 9.

Claim.—"What I claim as my invention in the double hydrostatic press, is connecting the two rams substantially in the manner set forth, so that they shall operate together and with equal effect upon the platen of the press; all as set forth."

27. For an *Improvement in Churns*; Alexander Hall, Loydsville, Belmont county, Ohio, October 9.

The patentee says,—"The nature of my improvement consists in combining a vertical reciprocating dasher with a horizontal rotary dasher, so as to break and agitate the cream in two directions at once."

Claim.—"What I claim as my invention, is the combination of a reciprocating dasher with a revolving dasher, the two being arranged and operated substantially as set forth."

28. For an *Improvement in Burring Cylinders*; Charles G. Sargent, Lowell, Middlesex county, Massachusetts, October 9.

Claim.—"What I claim as my invention, is a cylinder for burring, opening, picking, carding, &c., cotton and wool, in which the burring or working surface is formed by alternate rows of sharp pointed teeth and thin metallic edges, either set spirally or straight across the cylinder, whether said teeth and edges are constructed and shaped as above set forth, or in any other way substantially similar thereto; it being distinctly understood that my claim is to the burring or working surface produced as above suggested."

29. For an *Improvement in Supporters for Telegraph Wires*; L. R. Livingston, J. J. Roggen, and Calvin Adams, Pittsburg, Pennsylvania; and Amos Kendall and Alfred Vail. City of Washington, D. C., October 9.

The patentees say,—"The nature of our invention consists in confining the shank of a telegraph wire holder or supporter in a protecting socket or cavity, by means of some suitable insulating substance, placed while in a fused or softened state in the socket around the shank of the wire holder or supporter; or, if preferred, the insulating substance can be first placed in the socket or cavity, and the shank of the wire holder or supporter inserted therein while it (the insulating substance) is in a soft state."

Claim.—"What we claim as our invention, is the uniting and confining the shank of a pendant wire holder, or the upright portion of a supporter, within a protecting socket or cavity, by means of some suitable insulating substance, placed while in a fused or softened state within the socket or cavity, and occupying the space between its interior surface and the shank of the holder or supporter, substantially in the manner herein set forth; not intending, however, to limit ourselves to the particular forms or positions of the insulated wire holders and supporters referred to above, the essence of our invention, as therein claimed, being the production of an insulated connexion between the wire supporters and the holders, by placing the insulating material, while in a fused or softened state, within a socket or cavity in the one, and around the shank of the other."

"We also claim the manner of confining the telegraph wire to the holder, by means of a notch or hook thereon, and a loop or link combined therewith, substantially as represented."

30. For an *Improvement in Hanging Shafts in Mills*; Edward Bancroft, Philadelphia, Pennsylvania, October 9.

The patentee says,—"The improvements referred to consist in making the bearings or support for shafts, whether hangers or pillow-blocks, in such a manner that they shall at all times, and under any circumstances, conform accurately to the journals of the shafts; also, in being susceptible of easy and accurate adjustment in a vertical direction, in case of any sinking or settlement of the walls or timber to which they may be attached, and, at the same time, not be more liable to be thrown out of line than bearings of the ordinary construction; and further, in making the oil-catcher form a part of the box of the hanger or pillow-block, by casting it thereto, thus giving it additional strength without unnecessarily increasing its weight."

Claim.—"I do not claim the suspending a box or bearing for a shaft by means of the ball and socket joint, nor the making the same in several parts; but what I do claim as my invention, is the general arrangement and construction of the complete hanger or pillow-block, with or without the oil catcher forming a part thereof, made substantially in the manner and for the purposes herein above described."

31. For *Improvements in Ore Washers*; Jacob Pritchett, Philadelphia, Pennsylvania, October 9.

Claim.—"What I claim as new and my invention, is, 1st, the arrangement of the bevel wheel, with a rib on the back, in combination with the pin, set screws, and pinions, which are for the purpose of giving a reciprocating rotary motion to the pan. 2d, The vibrating pump, in combination with the pan. 3d, The reciprocating rocker, with curved ribs, in combination with the shaft and its fingers, substantially in the manner and for the purpose set forth."

32. For *Improvements in Reciprocating Propellers*; Henry W. Hewet, City of New York, October 9.

The patentee says,—"The character of my invention consists in the construction of propellers for vessels, the main object sought being the conveyance of the propeller through the water so as to avoid, as far as possible, angular action, and render the motion parallel to that of the vessel."

Claim.—"What I claim as of my own invention, is the combination of the sliding frames, to which the paddles are attached, with the horizontal guides and vertical guides, said paddles being actuated by motion derived from, and mechanism connected with, the engine shaft, and the whole being constructed, arranged, and operating substantially as described, whereby a more extended horizontal motion of the floats, in comparison with the length of their vertical motion, is obtained."

33. For an *Improvement in the Manufacture of Band-Boxes*; William Tabele, City of New York, October 9.

The patentee says,—"The nature of this invention consists in forming inside the lower part of the body of the band-box, and inside the part surrounding the same composing the lid or cover, grooves or creases, by means of fluted and grooved rollers, and inserting in said grooves, by springing and glueing, concavo-convex heads, or top and bottom, and in applying above the top another concavo-convex top board, in such a manner as to give strength to the box, and leave a space between the lower edge of the body of the same and the bottom, to prevent the bonnets, hats, or other articles contained in the box, being injured by water or dampness getting in from below, and a space between the upper edge of the cover and the two concavo-convex spring boards of the top, to prevent the same being bent from anything heavy being placed on the same."

Claim.—"What I claim as my invention, is the construction of the concavo-convex heads, or top and bottom boards, inserted into grooves formed in the bodies of the box and lid, and secured by glueing with the additional concavo-convex top board, susceptible of being replaced at pleasure, as herein set forth."

34. For an *Improvement in Bed-Plates for Paper Engines*; William Clark, Dayton, Montgomery county, Ohio, October 9.

The patentee says,—"My improvement consists both in the form of the plate and the material of which it is made."

Claim.—"What I claim, is casting the bed-plate of the paper engine in one piece, having the cutting or grinding edges arranged over the surface of the plate in diamond or lozenge-shaped figures or curves, so as to present a number of angles or shearing edges, for the rags to pass over, between that surface and the roller above, in the manner and for the purpose set forth."

35. For an *Improvement in Lapping Machines*; Samuel Campbell, New York Mills, Oneida county, New York, October 9.

Claim.—"What I claim as my invention, is the manner in which the heads are constructed and arranged, so as to revolve in removing or changing the laps. Also, the introduction of the doubling roller as part of the same machine, and the manner in which the adjusting guides are constructed, so that one or more can be displaced, and the remainder uniformly divided into the same space occupied by the whole; whether the arrangements are precisely the same as herein represented, or in any other manner which is substantially the same, and producing a like result upon the same principle."

36. For an *Improvement in Elastic Cords for Suspenders*; Nelson Goodyear, City of New York, October 16.

Claim.—"What I claim as my invention, is the making of elastic cords for suspenders, by braiding or winding silk, cotton, or other threads, around cords of metallic or vulcanized India rubber whilst in a partially distended state, substantially as described, whereby springs of greater resisting force are produced than by any other known plan."

37. For an *Improvement in Cooking Stoves*; Hannibal Mathews, Cincinnati, Ohio, October 16.

The patentee says,—“The nature of my improvement consists in arranging the flues in a double-oven stove, the stove having the ordinary top or boiler flue, and also having the flue between the ovens divided into three compartments, the side flues of this division being entered by diving flues opening at the upper front corners of the stove, aside of the front door of the fire-place, carried down the back part of the lower oven, and discharged at its bottom and back corners: the bottom flue being an open one, with a central stay or guide-plate in the line of the breadth of the stove, so as to compel the draft to hug the sides and corners of the stove; the flue at the front of the lower oven being an open one, and the flue at the back of the upper oven being also an open one, so that, by throwing down a damper in the top or boiler flue, and a damper in the middle flue of the flues between the ovens, thus opening the said flues, the heat can be applied almost wholly to the upper oven, as in a premium stove, so called; and by closing said flues, by throwing up these dampers, the heat can be thrown around both the upper and lower ovens, and be distributed in the most equable manner; the top or boiler flue, (the whole of the said flue being in front of its damper,) and the middle flue of the flues between the ovens, (both before and behind its damper,) being converted more or less into hot air chambers, and the draft being forced down the front diving flues, and around the lower oven at the sides of the stove, through the side flues of the flues between the ovens, and at the back and corners of the lower oven, and down the open flues in front of, and beneath, the lower oven, and up the middle flue of the flues back of the lower oven, the open flue back of the upper oven, and thence up the stack or pipe.”

Claim.—"What I claim as new, is constructing and arranging the top or boiler flue, the middle flue, and the side flues of the flues between the ovens and the corner flues at the back of the lower oven, so that, by opening the dampers, the upper oven can be rendered operative alone, or, by closing the same dampers, be operated in connexion with the lower oven; the flues and guide-plate being so constructed and arranged that the heat and draft will be compelled to pass along the sides and corners of the stove, when these flues are thus, or in an equivalent manner, called into action, the heat being thereby most equably distributed, as the hot draft is thus made to traverse an equal distance both above and below the lower oven, and also surround the centre of the stove, and of course keep the said centre at the same temperature as the sides and corners; the whole being arranged, constructed, and combined in the manner and for the purpose described."

38. For an *Improvement in Ploughs*; Benjamin Seyler, Franklin county, Pennsylvania, October 16.

Claim.—"What I claim as my invention, is joining the lower edges of the mould-board and fixed land-side, by means of a sole cast in one piece with them, whereby the plough is greatly strengthened, and the fastening of the share rendered more secure.

"2d, I claim making an aperture through the side of the fixed land-side, for the purpose of introducing a wrench to turn the nut on the bolt which holds the share to the sole, the aperture being combined with the manner herein described of fastening on the point."

39. For an *Improvement in Apple Parers*; Charles P. Carter, Ware, Hampshire county, Massachusetts, October 16.

Claim.—"What I claim as my invention, is the use of the upright lever arm in combination with the rack-bar, for working the knife, in the manner and for the purpose set forth. I also claim the upright lever, in combination with the inclined lever bar and discharging bar, in the manner and for the purposes described."

40. For an *Improvement in Tanning Leather by Tannin and Acids*; Harmon Hibbard, Henrietta, Monroe county, New York, October 16.

The patentee says,—“The nature of my invention consists, 1st, in the use of a composition

of lime, wood ashes, (or potash,) and salt, for the purpose of removing hair or wool; also for the purpose of 'liming,' so called, instead of using lime alone, as in the old method.

"2d, In the use of a composition of salt, sulphuric acid, and sumac, oak bark, or any other tannin, for the process of tanning."

Claim.—"What I claim, is, 1st, the process of removing hair and wool from skins, and of liming them preparatory to tanning, by the use of the composition of lime, wood ashes, and salt, called composition No. 1, in the manner described.

"2d, I claim the process of tanning skins, by the use of tannin in combination with muriatic acid, generated by a mixture of sulphuric acid and chloride of sodium in water with the tannin, in the manner substantially as described.

"3d, I claim, also, the use of the acetate of lead in the above process of tanning, as described."

41. For *Improvements in Ore Washers*; Peter Von Schmidt, City of New York, October 16.

Claim.—"What I claim as my invention, is the rotating screen, substantially as described, in combination with the rockers and drag chains within it, substantially as described.

"I also claim the rotating screen, with the spiral blades on its outer periphery, in combination with the trough in which it works, and through which the substances delivered by the meshes of the screen are made to pass, substantially as described.

"I also claim the washing trough, with its compartments, in combination with the rockers and drag chains, substantially as described.

"And finally, I claim the longitudinal grooves or chambers in the bottom of the trough, and at right angles to the motion of the rockers, and in combination with such rockers, substantially as described."

42. For *Improved Machinery for Drawing Out and Compressing Heated Iron*; Henry Burden, Troy, Rensselaer county, New York, October 16.

Claim.—"What I claim as my invention, is the method of working puddlers' balls, or other highly heated masses of iron, and reducing them into bars, by rolling and squeezing them gradually from one end, by surfaces whose motion or motions is at right angles, or nearly so, to the axis of the bar to be produced, substantially as specified.

"And I also claim as my invention in the machinery for the application of my improved method of working iron, the rolling and squeezing of balls, or other highly heated masses of iron, between surfaces inclined to the axis of the bar to be produced, substantially as described, so that, by the motion of one or more of the said surfaces at right angles, or nearly so, to the axis of the bar to be produced, the mass of iron shall be gradually squeezed and reduced, and carried towards and out of the space between the said inclined surfaces where they are nearest together, the iron bar being thus delivered in the required form, substantially as described."

43. For *Improved Journals for Oscillating Propellers*; Matthew A. Crooker, City of New York, October 16.

Claim.—"What I claim, is the application of springs to the journal boxes, in such a manner as to ease the strain upon the cranks and paddles when the paddles meet with an extra weight or resistance suddenly, thereby lessening very materially the danger of breaking the cranks and other parts of the machinery, which are combined and operate substantially as set forth."

44. For an *Improvement in Boot Crimps*; Benjamin Livermore, Hartland, Windsor county, Vermont, October 16.

Claim.—"What I claim as my invention, is the method of securing and holding on to the leather, by means of the wedge operating in the mouths or openings in the ends of the prongs of the instrument, as described and set forth."

45. For an *Improvement in Accoucheurs' Chairs*; Newman W. Smith, Shutesbury, Franklin county, Massachusetts, October 16.

Claim.—"What I claim as my invention, is the seat, which, from its peculiar form and structure, closely resembles that part of the human frame between the knees and the breech.

"And I further claim varying the angle which the seat makes with the back, by moving the middle posts forward or backward by means of the tightening screws, the grooves on the front end of braces, through which grooves the said tightening screws pass into said middle

posts; the object of all which is to afford relief to a patient in travail, by means of changing her position, and furnishing supports for her feet and limbs, and objects for her hands to grasp."

46. For an *Improvement in Instruments for Arresting Hemorrhage from Internal Organs or Cavities*; Ashbel B. Haile, Norwich, New London county, Connecticut, October 16.

Claim.—"What I claim as my invention, is the application of an elastic and distensible bag, sack, or bottle, to various of the canals or cavities of the human body, opening externally, and the subsequent distension of the same by forcing into it air or other available fluid, for the purpose of arresting hemorrhage."

47. For *Improvements in Looms for Figured Fabrics*; Joseph Reynolds, Providence, Rhode Island, October 16.

Claim.—"What I claim as my invention, is a combination of machinery composed of the following elements, and applied to a series of shuttle boxes, for moving or operating them as specified. The first element of combination is the series or two packs of pattern plates; the second element is the two slide or moving frames, by which the plates are moved horizontally, as described; the third element is the machinery for moving the pattern plates in vertical directions, one set being moved upwards and the other set downwards, substantially as specified; the fourth element is the system of hooks, their lever-plates, bell-crank levers, and connexions; the fifth element is the slide-board and its series of slides, and their projecting pins and appliances, as above described; the sixth element is the system of bent levers, pawls, and mechanism for moving the same, as described; the seventh element is the toothed sector and rack, which connects the long arm of the series of shuttle-boxes with the slide-board.

"I also claim the combination of machinery applied to shuttle-boxes, and for the purpose of preserving the position of the series while any shuttle thereof is in operation; the said combination consisting of the series of pins, the fork lever, the lever *n*², and its hinged spring plate, the slide and its pins or studs, the spring pawls and their appurtenances; the whole being made to operate together substantially as specified."

48. For an *Improvement in Cooking Stoves*; Thomas G. Clinton, George H. Knight, and Edward H. Knight, Cincinnati, Ohio, October 16.

Claim.—"What we claim as new, is, 1st, providing for the escape of the steam and effluvia from the cooking victuals in a reverberating boiler chamber, a channel arranged so as at the same time to isolate the upper oven from the top flue, and, by means of the currents, keep it cool, as well there as where bounded by the fire-plate.

"2d, So forming and arranging the plates dividing the lower from the upper oven and ash-pit, with a descending flanch to the upper plate, and an ascending flanch to the lower plate, that a passage to the flues, for the fumes of the lower oven, is provided, without weakening the plates or permitting the ashes to fall through.

"3d, So arranging a vertical dividing plate in the front flue, in connexion with a damper, that a part of the heat of the fire can be applied more directly to the front plate of the lower oven.

"4th, So constructing and arranging a damper, in connexion with the flues, division plate, and stack, with or without the recess in the front plate, as described, that the draft can be thrown either entirely around the stove, or in part down the front of the same, or be entirely shut off, or have direct entry to the stack."

49. For an *Improvement in Grate Bars*; Cornelius Kingsland, Allegheny, Allegheny county, Pennsylvania, October 16.

Claim.—"I claim as my invention, making the upper and lower faces of the bar with the same rise or elevation, so that when the upper or top face of the bar is destroyed by the action of the fire, the bar can be turned or inverted, making the lower side to become the upper surface, and by that means present a new surface to the fire, causing thereby a considerable saving in the expense of furnace bars."

50. For an *Improved Method of Attaching Knobs to Doors*; James A. Crever, Pittsburg, Pennsylvania, October 16.

Claim.—"What I claim as my invention, is the mode of holding in position the knob, by means of the end of the latch, being pressed through the opening into the stirrup."

51. For an *Improvement in the Rockers of Gold Washers*; Thomas J. Green, Jamaica Plain, Norfolk county, Massachusetts, October 16.

The patentee says,—“The nature of my improvement consists in giving to the rocker a compound motion, so that when it is rocked to and fro on the rails, it shall at the same time be shaken, and the perforated plate placed therein will be moved from side to side.”

Claim.—“What I claim as new, is the compound action rocker, constructed and arranged substantially in the manner and for the purpose set forth, consisting of rockers with ribs or projections thereon, and springs to arrest them.

“I also claim the sliding plate, in combination with said ribbed rocker, as described.”

52. For an *Improvement in Bog-Cutting Machines*; Abner Follet, Windham, Windham county, Connecticut, October 16.

Claim.—“What I claim as my invention, is the box or sledge, provided with horizontal and vertical knives, which project from its side, cutting off the hummocks or tufts; the whole being made and arranged as set forth.”

53. For an *Improved Double Cylinder Spike Machine*; Edwin B. White, Nashua, Hillsborough county, New Hampshire, October 16.

Claim.—“What I claim as my invention, is the method of forming or compressing a spike between half dies on the periphery of two cylinders revolving in opposite directions, the axis of the spike being parallel with the axis of the cylinders, substantially as described; said cylinders being provided with appropriate devices for cutting off, feeding in, and heading the spikes.”

54. For an *Improvement in Machines to Manufacture Horse Collars*; William Criswell, Butler, Butler county, Pennsylvania, October 16.

The patentee says,—“The nature of my invention consists in bending and holding collars against the central former, by means of segmental slides and keys, inserted into apertures in the bench, to do away with the present mode of bending and holding the collars against the former by the hands of the operator and a mallet.”

Claim.—“What I claim as my invention, is the combination of the T-shaped segmental sliding forming blocks with the central oval-shaped forming block, and mortised bench into which they are secured; said sliding segmental forming blocks being pressed against the rim of the collar by means of keys, in the manner set forth. The oval-shaped former and bench are not claimed individually or in connexion, as they have been heretofore used for making horse collars, in combination with a rope and windlass for drawing the collar around the block; the before described machine being principally designed for bending and holding the rim of the collar to its required form;—the shaping of the rest of the collar being done in the usual manner.”

55. For an *Improved Method of Giving a Rotary Motion to the Melted Iron in Casting Chilled Rolls*; John C. Parry, Pittsburg, Pennsylvania, October 16.

The patentee says,—“My invention consists in an improved method of giving to the melted metal, as it rises in the mould and chill in which the roll is cast, a rotary or swirling motion. The effect of this motion is to throw any foreign matter, slag, or dross, and the lighter particles of the melted metal to the centre, so that the heavy and best portions of the iron are at the outside or surface of the roller or other casting.”

Claim.—“What I claim as my invention, is the application of a guide to the mouth of a gate entering the mould horizontally in direction at right angles to the axis of the cylinder, for the purpose of producing the swirling motion of the iron. I also claim, in connexion with the guide, the use of the collar, connecting at all parts of its circumference with the mould, so as to admit the iron in a steady stream at all parts at the same time.”

56. For *Improvements in Jacquard Looms*; E. B. Bigelow, Clintonville, Worcester county, Massachusetts, October 23.

The patentee says,—“The first part of my invention consists in giving to the jacquard a separate organization independent of the loom, that the various motions of the jacquard may be taken from, or given by, a shaft or shafts within it, and simply deriving its or their rotation from some part of the loom, or from some first mover corresponding with, or regulated by,

the motion of the loom or part thereof, that the motions of the jacquard may correspond with those of the loom. In this way the motions of the jacquard are rendered more accurate and steady, and the weight of the motive parts is greatly reduced.

"The second part of my invention consists in making the whole frame of the jacquard adjustable at one operation relatively to the frame of the loom, that the distance between the two may be adjusted to the varying lengths of the cords of the harness, whereby the utmost nicety in the adjustments can be obtained.

"The third part of my invention relates to the shuttle-motion of looms which have series of shuttle-boxes in separate pendulous frames at the sides of the lay, and consists in communicating the required motions to the picker-staffs, and to the apparatus for shifting the shuttle-boxes, from a shaft or shafts above, whereby I avoid the difficulty of communicating the motions from a shaft or shafts below, to the picker-staffs and the apparatus for shifting the shuttle-boxes, which must be attached to, or connected with the shuttle-box frames that vibrate on axes above.

"And the last part of my invention relates to the introduction, in power looms, of a reversing motion."

Claim.—"What I claim as my invention, is, 1st, giving to the jacquard frame of jacquard looms, working by power, a separate organization: that is, giving the various motions of the jacquard by a shaft or shafts within, or making part of, the jacquard, in contradistinction to the weaving loom, but receiving motion from the loom, or from some first mover governed by, or working in unison with, the loom, substantially as described, and for the purpose specified.

"2d, I claim the method of adjusting the jacquard frame relatively to the weaving loom, substantially as described, so that the attendant can, from a given point, make the adjustment to suit the condition of the harness, as described.

"3d, I claim taking the motions, for operating the picker-staffs and the apparatus for shifting the shuttle-boxes, from a shaft or shafts placed above, and in combination with, the pendulous frames which carry the shuttle-boxes, substantially in the manner and for the purpose specified.

"And lastly, I claim, in combination with the power loom, a reversing motion, substantially as described, so that, after the driving power has been removed, and the momentum of the moving parts arrested, the attendant may set in motion the reversing motion, and drive the loom in the reverse direction, to bring the parts to the position required for re-starting, substantially as described."

57. For an *Improvement in Cooking Stoves*; James R. Stafford, Cleveland, Cuyahoga county, Ohio, October 23.

The patentee says,—"The nature of my invention consists in heating the bottom oven plates of stoves or ranges, by other means than by causing the flame, smoke, or air, which has passed through the fire, to pass under the same, as is herein more particularly described."

Claim.—"What I claim as my invention, is the manner herein described, of causing the air contained within the oven and spaces to circulate within and under the oven, without allowing the heated air to pass from the oven or spaces into the fire-chamber or smoke-pipe; which effect is produced by locating the plate *e* within the oven and near the fire-back *d*, and connecting the space between *e* and *d* with the body of the oven, and with the space between the bottom plate of the oven and the plate *b*, and also connecting the space below the bottom plate of the oven with the rear end of the body thereof, substantially as herein set forth."

58. For an *Improved Spring Latch-Bolt*; Elias M. Ray, Norfolk county, Massachusetts, October 23.

Claim.—"What I claim as my invention, is arranging the spring in the cavity of the bolt, with one end of said spring bearing upon the end of the cavity in the bolt, and the other end of it, or its equivalent, upon the tumbler, as herein described; whereby I am enabled to dispense with the usual bearings for the spring external to the bolt."

59. For an *Improvement in Planing Machines*; Enos G. Allen, Boston, Massachusetts, October 23.

The patentee says,—"My invention consists, first, in a peculiar arrangement of the feeding apparatus, and second, in peculiar arrangements of the mouth-pieces of the plane irons, for the purposes described."

Claim.—"What I claim as my invention, is the combination of adjustable stationary planes

with an endless band, supported transversely by friction rollers, whose axes are immediately below the cutting edges of the plane irons, and longitudinally by strips, substantially in the manner and for the purpose herein set forth."

60. For an *Improvement in the Construction of Iron Stairs*; Benjamin F. Miller, City of New York, October 23.

The patentee says,—“My improvement consists in making use of what I term a series of bent stationary levers.”

Claim.—“I claim as my invention, constructing stairs in sections composed of the bent lever and under brace connected together, as shown, the tread and brace being part and parcel or continuous with the balusters, the one bent at right angles, the other at the requisite angle for the brace.

“I also claim the bent levers, as herein before described, in combination with the rail, either continuous or in sections, attached to the end of the long arm of said lever, together with the under brace attached to the angle or bend of the short arm of said lever.”

61. For an *Improved Arrangement of the Lever Half-Beam of Steam Engines*; Wm. A. Lighthall, Albany, New York, October 23.

The patentee says,—“My improvement consists in reversing or inverting the pendulum half-beam, by fixing or placing the main beam centre below instead of above, by which means I employ a different order of lever than when working the beam as a hanging or pendulum half-beam, because, in the latter, the weight or resistance to be overcome is between the power and the fulcrum, whereas, in my improved application of the half-beam, and mode of working the same, the power is applied between the fulcrum and the weight or resistance to be overcome, which mode of applying the power enables me to work a long crank instead of a short one.”

Claim.—“What I claim as my invention, is the arrangement of a horizontal cylinder, with a lever half-beam having its fulcrum at its lower end, and connecting-rod attachment at its upper end, with crank and shaft above the cylinder, substantially in the manner and for the purposes herein before described.”

62. For an *Improvement in Blocks for Holding Daguerreotype Plates*; Alexander Beckers, City of New York, October 23.

Claim.—“What I claim as my invention, is the application of the cross-piece and lip-clips with the thumb-screw, to hold the plate to be polished on the face of the plate *d*, the plate below the centre of the thumb-screw being fitted to receive, through an aperture in the centre of the screw, a point or stud on a lever, by which the plate *d* can be moved in alternate and opposite directions across the face of a rotary chuck, for the purpose of polishing or cleaning Daguerreotype plates, substantially as described.”

63. For an *Improvement in Looms*; Augustus Faulkner, Walpole, Cheshire county, New Hampshire, October 23.

The patentee says,—“The nature of my improvement consists, 1st, in a particular arrangement and movement of the heddles, by which two separate sheds are produced, through one of which the shuttle carries the weft in moving from left to right, and through the other in moving from right to left, the shuttle always moving in the same direction through the same shed, thus forming a continuous tubular web.

“2d, In the attachment of spring or weighted whip rolls or rods, by which the slack of the warp is taken up; and

“3d, In the arrangement for drawing the cloth through the loom with unequal velocity, so as to render its texture alternately closer and more open in different portions of its length.”

Claim.—“What I claim as new, is straining the several divisions of the warp from the same yarn beam equally, by passing the adjacent yarns of the respective sheds over the same whip roll, the extreme yarns being passed over a second whip roll, substantially as described.

“I likewise claim varying the closeness of the texture of the web, by varying the speed of the rolls by which it is drawn through the loom, by devices substantially as set forth.”

64. For an *Improvement in Invalid Bedsteads*; John Karney, Cincinnati, Ohio, October 23.

Claim.—“What I claim as my invention, is the use of the lever to alternately raise and depress the sliding boxes, when these boxes are combined with the horizontal drawer for al-

ternately placing the chamber and cushion under the permanent opening in the mattress, as described."

65. For an *Improvement in Apparatus for Distilling Sea Water*; John Ericsson, City of New York, and R. B. Forbes, Boston, Massachusetts, October 23.

The patentees say,—“Our invention consists of a boiler, to be worked at very low pressure, with horizontal flue-tubes so situated, relatively to the door for supplying the fuel to the grate, that the opening of this door will expose the flue-tubes to view, and admit of cleaning out the soot that unavoidably collects in, and which would otherwise choke them.

Also, in connecting the steam chamber of the said boiler with the upper end of a condenser, by a flexible pipe attached to a bonnet or dome, which rests on and closes a large aperture at the top of the boiler, in the manner of a safety valve, that it may answer the manifold purposes of steam pipe connexion, safety valve, steam dome or chamber, hand hole, for giving access to the inside of the boiler, and for ascertaining by inspection the height of water in the boiler.

“Also, in condensing the steam, by causing it to pass between two vessels, the inner one kept cool by the flow of water through it, and the other by the evaporating action of the atmosphere on moist cloth or other porous substance surrounding it, that the required condensation may be effectively attained in very warm climates.

“Also, in employing, in combination with the boiler and the condenser, a water feed pipe having a double connexion, one with the boiler and the other with the condenser, whereby the same feed pipe supplies the boiler and condenser.

“And finally, in combining with the boiler and the feed pipe a feed cistern with a cork or other light float, which, when the water is at the required height in the boiler, will be forced up to close the aperture of the feed pipe, and thus cut off the supply.”

Claim.—“What we claim as our invention in the before described apparatus for the distillation or production of fresh water on board of ships or other vessels, is connecting the steam boiler with the condenser by means of a flexible pipe, substantially as described, in combination with the valve-joint connexion of the bonnet or steam dome covering the hand hole in the top of the boiler, substantially as described, whereby this connexion is rendered of manifold uses, as described.

“We also claim condensing the steam by passing it in a space between two vessels, the inner one kept cool by a current of water, and the external one surrounded by woolen or other porous substance to be kept in a moist state, to condense the steam by the evaporating effect of the atmosphere on the moistened surface surrounding the outer case, substantially as described, whereby the apparatus is especially adapted to very low latitudes, as described.

“And finally, we claim the feed pipe for supplying water to the condenser, and for feeding the boiler, substantially as described, in combination with the cistern that conducts the feed water to the boiler, and provided with a float for regulating the flow of water from the feed pipe, substantially as described, whereby the apparatus is rendered self-feeding without liability of derangement, as described.”

66. For an *Improvement in Surfacing Floor Oil Cloth*; James D. Sparkman, Williamsburg, and Melville Kelsey, Brooklyn, assignees of William Berry, Bedford, Kings county, New York, October 23.

Claim.—“I claim as new as follows: The application of the fixed suspending timbers, or slotted railways, and carriage *g*, with the changeable slotted timber or railway, to carry and adjust the working parts at different heights and positions on the grounding frames, conjointly with the arrangements described and shown, by which the arms and a plurality of surfacing blocks, *pp*, are applied to smooth the face of the canvas, by the power of a man or men, operating through the crank and cylinder and pinion, in alternating right lines on the rack, and kept in place by the collar, carriage *x*, and rollers; and the employment, conjointly with the foregoing parts, of the blocks *g* and screws, to adjust the pressure *pp* on the face of the canvas operated on; the whole constructed, arranged, and operating substantially in the manner and for the purpose described and shown.”

67. For an *Improved Circular Saw-Set*; Elhanan W. Scott, Lowell, Middlesex county, Massachusetts, October 23.

Claim.—“What I claim as my improvements, are the diagonal and angular adjustable slotted gauges attached to the set, in the manner and for the purposes described.”

68. For an *Improvement in Locomotives for Ascending Inclined Planes*; Andrew Cathcart, Madison, Jefferson county, Indiana, October 23.

The patentee says,—“The nature of my invention consists in so constructing a locomotive that, while its speed on ordinary grades is not affected, yet it can, when required, draw a heavy load up a steep inclined plane. It is based upon the assumption that the power of a locomotive available in drawing a load (other things being equal) is proportioned to the amount of steam expended in moving over a given length of track; and therefore, in order that the tractive force of the locomotive may be increased, to enable it to exert sufficient power to draw the load up an inclined plane, the engine should consume the steam as fast when moving slowly up the ascent, as it does when moving on a level at its ordinary speed.”

Claim.—“What I claim as new, is a spring or other equivalent device, for holding a self-adjusting toothed driving wheel in gear with a toothed rack, substantially as set forth.

“I likewise claim the employment of steam acting on the piston of a supplementary cylinder, to throw an adjustable toothed driving wheel in or out of gear with a stationary rack, and at the same time to operate as a spring to hold it in either position, substantially as set forth.”

69. For an *Improvement in Apparatus for Holding Daguerreotype Plates*; William and William H. Lewis, City of New York, October 23.

The patentees say,—“Such improvements consist in so applying a horizontal vice to one end of the plate, that it shall be firmly held in place for that purpose by mechanical means.”

Claim.—“We claim as new, the application of the cam, acting to depress the rebated chop on the plate beneath, conjointly with the screw to adjust the parts, for the purpose of holding the plates while polishing the same, substantially as described.”

70. For a *Self-Adjusting Valve for Regulating the Admission of Air to Fan-Blowers*; Frederick S. Barnard, Zanesville, Muskingum county, Ohio, October 23.

Claim.—“What I claim as my invention, is the combination of the case of resisting plates, and mortised end plate, with the turning valve, when made with radial wings and segmental cut-off plates, retained in its required position by a spring, or by a weight, cord, and pulley, or other mechanical equivalent, said valve operating substantially in the manner and for the purposes set forth.”

71. For an *Improvement in Gearing*; Benjamin Arnold, East Greenwich, Kent county, Rhode Island, October 30.

The patentee says,—“The nature of this invention consists in making the large or main pulley, or the shaft or arbor of the lathe or engine, hollow, and arranging within the same cogged and eccentric gearing, of such construction and arrangement as will either cause said arbor or shaft to turn with a much lower motion than the pulleys, with a corresponding increase of power, or revolve with the same speed as the pulleys, at the option of the operator, thus dispensing with the ordinary complicated gearing, and the many disadvantages attending the same, and forming a simple and effective gearing enclosed within the main pulley, and not therefore liable to become entangled with the band, or to catch the hands, or otherwise injure persons working at the lathe.”

Claim.—“What I claim as my invention, is the mode of transmitting motion from the pulleys of a double-gear lathe or turning engine, to the main shaft or arbor of the same, with a decreased speed and a corresponding increase of power, by means of the eccentric secured on the inside of the large hollow pulley, and turning within the large wheel arranged eccentric with the shaft, and having cogs on the inner periphery of the projection, at its outer edge, meshing in gear with a circular cogged ring, secured to the inner surface of the detached face plate, and held stationary by the connecting rod or plate; and also the hub, keyed to the shaft or arbor, having arms made convex on their extremities and concave on their sides, so as to form circular openings or spaces when inserted in their places, in which the bolts or pins revolve in their passage around the axle or arbor, alternately striking the concave sides of the arms and causing them to revolve slowly, in such a manner as to cause the large cog wheel to revolve around the cogged ring just so many cogs as it possesses more than said ring, at every revolution of the eccentric, and a proportionate slow speed to be given to the shaft or arbor, as set forth, or in any other mode substantially the same.”

72. For an *Improvement in Feed Apparatus for Shingle Machines*; Henry Burt, Cohoes, Albany county, New York, October 30.

Claim.—"I claim a self-adjusting feed motion, produced by the interposition of friction between metallic surfaces, in the connexions of the parts of the driving gear, or any two of those parts, by means of a friction strap, as described, or any analogous mode, which shall allow the adaptation of the speed of the carriage, holding the material to be cut, to the resistance the material affords to the saw, especially in cases where unusual and temporary obstacles, such as knots, &c., interpose, which might otherwise cause the destruction of the teeth of the saw and other parts of the machine, a very important practical result of the adjustment being that it produces smoother sawing in stuff of irregular texture than machines now do."

73. For an *Improvement in Looms*; Henry Bachofner, Springfield, Hampden county, Massachusetts, October 30.

The patentee says,—"The nature of my improvement consists in the construction and arrangement of parts for working the harness, and their connexion with the moving power, by which I simplify the loom and save a considerable amount of the power required to drive looms as heretofore constructed."

Claim.—"What I claim as new, is, 1st, the combination of the jacquard cylinder with the depressing frame and fingers, for the purpose of working the uprights thereby through the medium of the fingers, as set forth.

"2d, I claim the combination of the lifting and depressing frames with the crank shaft, by means of a rock shaft, connected with said frames by connecting rods, and worked by the crank shaft, with which it is connected by a rod for that purpose.

"3d, I claim the frames for suspending and carrying the harness, in combination with the marches and the apparatus for working the same, as specified.

"4th, I claim the combination of the hooks, for lifting and depressing, with the marches and harness frames, without the aid of cords, as set forth.

"5th, I claim the construction and application of the adjustable crank, by which I effect an adjustment in all directions in a simple and convenient manner."

74. For an *Improvement in Stoves*; James Cole, Cincinnati, Ohio, October 30.

The patentee says,—"The nature of the first part of my invention consists in making the point of discharge for a reverberated current of the results of combustion immediately aside of the point of intensest combustion in the primary current thereof, by admitting jets of atmospheric air from points sufficiently elevated, down into an otherwise closed fire chamber, and directly upon the burning fuel, so as to bring the air into contact therewith, and transmute it throughout the gases evolved during combustion; and consists, also, in forcing the heated jets of air, and the gases, to pass to a reverberating drum, through an orifice so restricted and limited that the adjoining end of the drum can be made to constitute a channel around this, the point of intensest combustion, by which channel the reverberated current flows around, and is brought into close contact with the current rushing out of the fire chamber, so that any unconsumed combustible gas in the reverberated current is at its lowest degree of temperature, and, when it most needs it, attracted to be re-inflamed again, and carried along by, and commingled with, the current from the fire chamber, at the latter current's highest temperature and inflaming capacity, previous to being drawn off by the exit pipe attached to the said channel, and opening immediately aside of, and above, or in a horizontal drum below or above the said orifice.

"The nature of the other part of my invention consists in prolonging, controlling, and equalizing the passage of the reverberated current to the exit pipe, by inserting a disk or diaphragm at a level immediately above the opening to the exit pipe, this disk having a central orifice somewhat larger than, and directly in line with, the orifice in the fire chamber, and being perforated with small holes over three-fifths of its area or thereabouts, on the part over the channel or discharging chamber opposite the exit pipe; the part of the disk over the exit pipe being intact, so that all discharges from the reverberating drum must be made between the current from the fire chamber and the verge of the central orifice in the disk, except so much as must pass through the perforations in the area of the disk, as before mentioned; the whole being thus made to flow around and by the current from the fire chamber, as the unequalizing and direct influence of the draft of the exit pipe is shut off by the disk being left entire in the part resting over the opening for said pipe."

Claim.—"What I claim as new, is concentrating the issue of the gases evolved during combustion, as they pass from the fire chamber into a reverberating chamber, and are at that

point commingled with jets of air, the said issue or orifice being in the proportion of a circle of one-third (or less) the diameter of the reverberating chamber into which it opens, and combined with an opening for the discharge of the reverberated current, as illustrated by the fire bowl, orifice, drum, and opening, and for the purposes set forth.

"I also claim the disk inserted immediately above, or on a level with, the top of the opening for the exit pipe, and having a central orifice of suitable diameter, and perforations, arranged as described, and for the purposes set forth.

"I also claim the disk, constructed as described, in combination with the orifice, as described, and for the purposes set forth.

"I also claim locating the opening for the exit pipe, as described, in combination with the disk and the orifice, in the manner and for the purpose set forth."

75. For an *Improvement in Keeping Ledger Accounts*; Andrew J. Folger, Nantucket, Nantucket county, Massachusetts, October 30.

The patentee says,—"The nature of my invention consists in the construction and arrangement of an alphabet ledger in a novel manner and form, for the purpose of facilitating the work of reference to individual accounts in posting."

Claim.—"I claim the box with the plate or false bottom, constructed with the slits for the reception of the cards, the said cards being arranged with two alphabetical indices, arranged at right angles to one another, as a direct index reference to the name and surname of individuals with whom accounts are kept.

"I also claim the card index, formed with the shoulder to suspend the card in the slit of the plate or false bottom, and to form part of said card to pull it out and insert it in the slit, as described."

76. For an *Improvement in Barrel Carriages*; William Furley, Smithsburg, Washington county, Maryland, October 30.

Claim.—"What I claim as my invention, is the combination of the arcs and hinged legs with a barrel carriage, substantially in the manner and for the purpose set forth."

77. For an *Improvement in Mills for Grinding*; Lewis Fagin, Cincinnati, Ohio, October 30.

Claim.—"What I claim as new, is, 1st, surrounding the feeding tube and cup with a shield, constructed and attached as described, or in any analogous manner, and for the purpose described, viz., preventing the blast of air from disturbing the regularity of the feed, and deflecting and directing the same vertically downwards, so as to cause it to force the grain between the grinding surfaces of the stones.

"2d, Inserting and extending down into the eye of the runner a cylinder to which the balance rive is permanently attached or cast, (whether made with or without a metallic back and hoop for the stone,) attached at its upper portion to the stone, forming, with the eye of the runner-stone, at its lower portion, a recess into which the stationary cylinder of the bed-stone projects, and furnishing an attachment for the balance rives, elevated above the centre or face of the runner; the whole being arranged as described, or in any analogous manner, and for the purpose described, viz., preventing any grain jumping over the top of the stationary cylinder that stands on the bed-stone, and hanging against or choking the eye of the runner-stone, directing the air blast vertically downwards, in connexion with the cylindrical projection of the shield, and, most important of all, affording an attachment for the balance rive above the level of the grinding surface of the runner, thus leaving the same undiminished and unbroken, and avoiding the usual interference of the balance rive and driver with the feed, or its tendency to hanging in the eye of the runner-stone, if the stationary cylinder on the bed-stone is not used.

"3d, Attaching to the bed-stone a cylinder resting on suitable feet, and within the sweep of the eye of the runner, the cylinder or circular partition being of such diameter and elevation as fit it to project up into the recess formed by the eye of the runner-stone and the cylinder which is inserted and attached therein, and to allow the same to revolve around and within it; the whole being arranged as described, or in any analogous way, and for the purpose described, viz., preventing the grain coming into contact with, or being carried around by, the revolving runner, and thereby hanging in and choking the eye of the same, the grain not having the same tendency to hang on the vertical wall of a stationary cylinder, and also continuing the vertical and downward direction given to the blast until it escapes between the stones.

"4th, In combination with the closed air chamber for passing the blast between the stones, dressing the inner, and leaving without dress the outer, portion of the area or face of the

stones: say, from the circle described by the eye of the runner, dressing one-half of the radial distance, more or less, thence out, and leaving the balance all land.

"5th, The combination of the shield, the cylinder *n*, and the cylinder *E*, arranged and constructed as described, or in any analogous way, and for the purpose described."

78. For an *Improved Weather Strip*; Ebenezer Garnsey, Watertown, Litchfield county, Connecticut, October 30.

Claim.—"I claim the hinge, constructed as set forth, in combination with the mode of stopping the same from shifting its position horizontally to the right or left hand when in ordinary use.

"I also claim the method of detaching the lower strip when desired, by the method described, in combination with the mode of keeping the lower strip suspended above the sill, as set forth."

79. For an *Improvement in Planing Machines*; Jeter & Watson, assignees of Hugh Jeter, Lexington, Fayette county, Kentucky, October 30.

The patentee says,—"The nature of my invention consists in so arranging the springs which act upon the lumber in the machine, that they shall adapt themselves to its thickness, the pressure being light for thin boards, and proportionably heavy for thick boards or plank."

Claim.—"What I claim as new, is graduating the pressure applied to the lumber on the rest, in proportion to its thickness, substantially as set forth."

80. For an *Improvement in Flour Packers*; Nathan Kinman, Buffalo, New York, October 30.

Claim.—"What I claim as new, is, 1st, the packing apparatus, consisting of a combination of the tube and inclined blades, for condensing the flour and retaining it while moving the barrel, substantially in the manner and for the purposes set forth.

"2d, I claim the hollow shaft, for expelling the air from the barrel in packing, as described. I also claim the self-acting clutch, in combination with the packing apparatus, in the manner made known."

81. For an *Improvement in Fences*; Lucius Leavenworth, Trumansburg, Tompkins county, New York, October 30.

The patentee says,—"The nature of my invention consists in an arrangement of wire for connecting pickets or palings together, to make a fence for yards or fields, and of fastening the fence, so constructed, to posts set in the ground,—a method of making a fence which is strong, economical, and handsome."

Claim.—"What I claim, is the mode of fastening pickets or paling fences, by means of a series of links formed on the wire, for receiving and retaining the pickets, the ring for securing the wire to posts, and the hooks for connecting the pieces of wire together in a line of fence, in the manner substantially as herein set forth."

82. For an *Improvement in Power Looms*; Roger Lightbown, Eaton, Madison county, New York, October 30.

The patentee says,—"The nature of my invention consists of the following improvements on the power loom, viz:—

"1st, Of an arrangement of a stop-rod, in combination with a lever or click, that operates on a cam on the fast pulley when the shuttle becomes accidentally entangled in the web and stopped in its passage, and instantaneously stops the driving shaft of the loom, thereby preventing smashes and breakages.

"2d, Of an arrangement of a spring attached to a treddle, in combination with a cam on the lower shaft of the loom, with fingers or arms on the ends of the stop-rod, and with fenders in the shuttle-boxes, whereby the velocity of the shuttle is checked as it enters the boxes, to prevent it from striking too forcibly against the pickers, while it offers no obstruction to the free passage of the shuttle when driven out of the boxes.

"3d, Of the construction and arrangement of two conical pulleys, in combination with a sliding wedge or inclined shoe, moved by a weight, and the pad-lever, in such manner as to regulate the motion of the warp-beam as the warp is unwound therefrom in weaving, and the size of the roll is diminished."

Claim.—"What I claim, is, 1st, the cam on the fast pulley, in combination with the lever

or click, the crooked rod, the coil spring, the catch, and the lever, constructed and arranged in the manner substantially as described, for the purpose of arresting the loom at pleasure, as herein set forth.

"2d, I claim the mode of stopping the loom instantaneously by a self-acting operation, when the shuttle gets caught in the race-way of the lathe, by means of the chisel, on the rod *e*, catching against the head on the crooked rod, and projecting the click or brake against the cam on the fast pulley, in the manner substantially as described.

"3d, I claim the combination of the vibrating lever or treddle, and the connected spring, with the cord or rod *f*, the vibrating fingers on the rod *e*, and the fenders for the purpose of arresting the momentum of the shuttle as it enters the boxes, the cam on the shaft operating and giving motion to the fingers, in the manner substantially as described."

83. For an *Improvement in Stoves*; Adolphus Lotze, Cincinnati, Ohio, October 30.

Claim.—"What I claim as new, is attaching the exit pipe to the funnel-shaped tube or shute, so as to collect and transmit down into the fire the soot precipitated during the passage of the results of combustion to the exit pipe, substantially after the manner and for the purpose described."

84. For an *Improvement in Mills for Grinding*; David Marsh and Eli B. Nichols, Fairfield, Fairfield county, Connecticut, October 30.

Claim.—"What we claim as new, is, 1st, the construction and application of the cup, with edges to receive the bail and spindle, preventing the ends of the spindle from separating, thereby forming a more permanent attachment to the bail.

"2d, The construction and application of the cylinder, with screw flanches outside and spiral plate inside, forming a screw to force the grain between the stones, and also to prevent its jumping out of the eye, as the running-stones and bail give the grain or other material a rotary motion against the direction of the stationary screw flanch, substantially as described."

85. For an *Improvement in Washboards*; Orrin Rice, Cincinnati, Ohio, October 30.

The patentee says,—"The nature of my invention consists in the mode of manufacturing washboards out of metal and wood combined, by so preparing the sheet of zinc or other metal that, by sharpening two parallel edges, and crimping the sheet from one of these edges to the other, I am enabled, by using pressure, to incise and fasten to the wooden sides the sheet thus prepared."

Claim.—"What I claim as new in the mode of manufacturing washboards, is incising, with the edges of the sheet metal, prepared and crimped as described, the legs, or the legs and body-board, by the suitable application of pressure thereto, thereby fitting and attaching the one to the other at one operation, and with a comparatively water-tight joint."

86. For an *Improved Means for Working Sails*; William A. Ross, Port Richmond, Richmond county, New York, October 30.

The patentee says,—"My improvement in, or addition to, the parts employed about the foresails of sloops or schooners, or the jibs of these or other vessels, or any other fore-and-aft sail, when the foot of the sail is stretched flat or straight by a boom, consists in the addition of a rope, so fitted that it prevents the sail from sticking or stretching, so as to tear at the diagonal line or point of shortest distance between the after end of the boom and the bolt rope of the sail, thereby facilitating the furling or stowing of the sail when lowered, and aiding in setting the sail when hoisted."

Claim.—"I claim as my invention, the attachment of a rope to the bolt rope of a sail, to act as a downhaul in lowering, and to sheet the sail home when hoisting, such rope passing by sheaves or blocks, or in any convenient manner, from one end of the boom to the other, so that it operates to release the cringle, and relieve the sail when lowering, and replace the cringle, and sheet home the sail when hoisting, substantially as described."

87. For an *Improvement in Electro-Chemical Telegraphs*; Robert Smith, Blackford, Perthshire county, Scotland, and Alexander Bain, Beevor Lodge, Hammersmith, Middlesex county, England, October 30.

The patentees say,—"These improvements consist, 1st, in the peculiar mode of arranging

the several parts herein described of our marking instruments of our electro-chemical telegraphs.

"2d, In a mode of constructing a style or point-holder, so as to afford a ready and convenient mode of regulating the pressure of the style or point on the surface of the chemically prepared paper, or other suitable fabric.

"3d, In a mode of applying a weight for regulating the pressure of an upper on a lower revolving wheel or roller, in motion, so as to grasp the strip of chemically prepared paper, or other suitable fabric, and ensure its being drawn continually forward.

"4th, In a mode of arranging the marking instruments, keys, wires, and batteries, in a single circuit, and in branch circuits connected therewith, so that a copy of a message sent from any station, may be marked upon the chemically prepared paper, or other fabric, at any desired number of stations in communication therewith, and also, if required, at the transmitting station."

Claim.—"What we claim as new and of our invention, is, 1st, the mode of arranging the several parts of our marking instrument for electro-chemical telegraphs, substantially as described.

"2d, We claim the mode of adjusting a style or point-holder, as described, so as to afford a ready and convenient mode of regulating the pressure of the style or point upon the surface of the chemically prepared fabric.

"3d, We claim the mode of applying the weight for the purpose of regulating the pressure, as described.

"4th, We claim the mode of arranging the marking and transmitting instruments, wires, and batteries in a single circuit, and in branch circuits connected therewith, so that a copy of a message sent from any one station, may be marked upon the chemically prepared paper, or other fabric, at one or any desired number of stations in communication therewith, and also, if required, at the transmitting station, without requiring the use of any secondary current."

88. For an *Improvement in Straw Cutters*; Jonathan Sullivan, Lexington, Davidson county, North Carolina, October 30.

The patentee says,—"The principle of this invention consists in using a series of circular knives or saws, arranged on an axle, as described. These knives may vary in size in different machines, from three to a greater number of inches in diameter; they are placed on the axle by means of holes through the centre of each, and at such distance apart as will cut the straw or other material of the required length: say one-half inch, more or less; on the axle, between the knives, are placed circular plates of wood or other substance, which are intended, by filling up the space between the knives to keep them firmly in position, their diameter being in all cases so much less than that of the knives, as to allow a projection of the knives beyond their verge to any required distance."

Claim.—"What I claim as my invention, is the operation of cutting and comminuting straw, substantially as herein described."

89. For an *Improvement in Springs for Carriages*; William S. Thomas, Norwich, Chenango county, New York, October 30.

Claim.—"What I claim as my invention, is the combination of the adjustable U-springs with the bent spring-reach, by bolting one end of said springs to said reach, and connecting the bend of said spring to the bent part of the reach by an adjustable link or clasp, in the manner and for the purposes set forth."

90. For an *Improvement in the Mode of Making Toothed Cylinders*; John L. Tuttle, Lawrence, Essex county, Massachusetts, October 30.

Claim.—"What I claim as my invention, is the improvement in the mode of setting and adjusting the teeth of toothed cylinders, made substantially as described, the said improvement consisting in the employment of the screw, in combination with the external tube of paper or metal, the said screw not only enabling me to set the teeth in a helix line, which presents great advantages in their operation, but to readily withdraw it (the screw) at the proper time, and for the introduction of the cylinder, as described."

91. For an *Improvement in Transverse Callipers*; William J. Van Ness, Baltimore, Maryland, October 30.

Claim.—"What I claim as my invention, is the transvers callipers, having legs so formed

and connected as to be inserted into the bung of a cask, to ascertain its length from head to head, or its width from side to side, substantially as described."

RE-ISSUES FOR OCTOBER, 1849.

1. For *Improvement in Power Looms for Weaving Plaids, &c.*; Erastus B. Bigelow, Clintonville, Worcester county, Massachusetts; patented April 10, 1845; re-issued October 9.

Claim.—"What I claim as my invention, is, 1st, regulating the delivery of the unwoven warps, as required for the weaving of the cloth, by the tension of the said warps, substantially as described, in combination with a brake or stop-motion, substantially as described, to prevent the tension given to the warps by the beat of the lay from affecting the delivery motion, as set forth.

"2d, I also claim, in combination with the method of regulating the delivery of the warps by their tension, and controlled by a brake, the taking up of the woven cloth by a regular and positive motion, substantially as described, that the figures produced thereon may be regular and well matched, the irregularities of the weft-threads being by this means taken up in the thickness instead of the length of the cloth.

"3d, I also claim, in combination with the roller of a positive and regular take-up motion of a weaving loom, the measuring wheel and hand or pointer, operated substantially as described, whereby the quantity of cloth woven is at all times indicated, as described.

"4th, I also claim communicating the shifting motion, for shifting the shuttle-boxes up and down when a change of color is required in the weft, by the gravitating force of a weight, or the equivalent thereof, substantially as described, whereby all injury to the mechanism is avoided should anything be interposed to arrest the motions of the moving parts, as described.

"5th, I also claim arresting the motion of the shuttle, and relieving the picker from the end thereof, preparatory to the shifting of the shuttle-boxes, by combining with the lay and picker a spring lever, one arm of which moves in a slot, or the equivalent thereof, to give it the required motion, substantially as described.

"6th and lastly, I claim stopping the loom, and arresting the momentum of the moving parts at a given and determined point, by means of a lever which, when the weft-thread is not carried through, is brought into contact with a spur on the crank-shaft, or the equivalent thereof, which forces it back to shift the belt; when this is combined with the fingers which enter recesses in the lay, and which, when the weft-thread is carried through, are pushed forward, to prevent the lever from stopping the loom, as described."

2. For *Improvements in Looms for Weaving Brussels Carpeting, &c.*; Erastus B. Bigelow, Clintonville, Worcester county, Massachusetts; patented March 10, 1849; re-issued October 9.

Claim.—"What I claim as new, is guiding and supporting the pile-wires as they pass between the warps, by means of a guide or guides, through or on which the sail wires slide, as above specified, or in any other way substantially the same."

3. For an *Improvement in Winnowing Machines*; John Thurston, Bath township, Franklin county, Indiana; patented January 6, 1848; re-issued October 9.

The patentee says,—"The nature of the first division of my invention consists in constructing the feeder with three or more successive slats or steps, each at an angle of about 20°, and having a free passage between each slat forming the same, for the escape of a portion of the blast of air caused by the fan, and in arranging and combining therewith, for the purpose desired, the parts attached to this slat feeder.

"The nature of the second division of my invention consists in constructing the separating riddle with a re-gathering and re-feeding shelf."

Claim.—"What I claim as new, is forming the feeder with slats one below the other in its bottom, and openings between them, the whole being made in this or any equivalent way, for the purpose described.

"I also claim the separating riddle, the shelf for re-gathering and re-feeding the grain and cheat, for the purpose described.

"I also claim giving the separating riddle and screen a rear vertical motion, in the manner and for the purpose described, whether the motion be given to each separately or conjointly."

4. For an *Improvement in Seed Planters*; Moses and Samuel Pennock, East Marlborough, Chester county, Pennsylvania; patented March 12, 1841; re-issued October 30.

Claim.—"What we claim as our invention, is, 1st, the simultaneous throwing into and

out of operation, by the movement of a lever, or other mechanical equivalent or device, each seeding cylinder and its respective drill or seed-tube, for the purpose of sowing with any number of hoppers and drills that may be required in sowing point or other irregular shaped land, without stopping the animal or animals attached to the machine; not intending to limit ourselves to the particular construction described, but to vary these in any way that we may deem proper, so that the before described results are effected by means substantially the same as those described.

"2d, We also claim the arrangement of the spur wheels for the purpose of connecting the seed rollers and hoppers to the shaft, as before described, in such manner that they can be disengaged or engaged at pleasure, whilst the machine is in motion."

DESIGNS FOR OCTOBER, 1849.

1. For a *Design for Stoves*; A. Cox & Co., assignees of George W. Chambers, Troy, New York, October 9.
2. For a *Design for Stoves*; A. Cox & Co., assignees of George W. Chambers, Troy, New York, October 9.
3. For a *Design for Stoves*; S. H. Burton, Cincinnati, Ohio, October 9.
4. For a *Design for Stoves*; Sherman S. Jewett and F. H. Root, Buffalo, New York, October 9.
5. For a *Design for Stoves*; William Savery, City of New York, October 9.
6. For a *Design for Parlor Stoves*; J. Cross & Son, Morrisville, Madison county, assignees of Samuel W. Gibbs, Albany, New York, October 9.
7. For a *Design for Stoves*; Edwin B. Finch, Peekskill, Westchester county, New York, October 16.
8. For a *Design for Stoves*; James Wager, Troy, New York, October 23.
9. For a *Design for Parlor Air-Tight Stoves*; Moses Pond, Boston, Massachusetts, October 23.
10. For a *Design for Stoves*; Hosea H. Huntley, Cincinnati, Ohio, October 23.
11. For a *Design for Air-Tight Cooking Stoves*; John F. Rathbone, Albany, New York, October 23.
12. For a *Design for Wood Stoves*; John F. Rathbone, Albany, New York, October 23.
13. For a *Design for Air-Tight Cooking Stoves*; John F. Rathbone, Albany, New York, October 23.

The claims to the above are to the designs of ornaments, mouldings, scrolls, &c., as described in the several specifications.

MECHANICS, PHYSICS, AND CHEMISTRY.

*Lecture on the Sciences as Applicable to Domestic Life, delivered at a meeting of the members and friends of the Retford Literary and Scientific Institution. By GEORGE CHAPMAN, ESQ.**

Continued from page 193.

A walk in the fields, whether they be clad in the russet livery of winter, or in the glowing tints of summer, is ever replete with subjects of meditation. Perhaps the first inquiry may be directed to the cloud of steam, which, as soon as we leave the warm atmosphere of the house, has become visible, issuing from our mouth and nostrils. Here we have an instance

* From the London Farmer's Magazine, for January, 1850.

similar to that mentioned in the bed-room, where the moisture occasioned by our breath was invisible till condensed on the cold window; whilst in the house our breath was not perceptible, the warmth being sufficient to keep it in a state of invisible vapor; but the cold air outside at once condenses it, and it becomes a cloud of steam. The hoar frost we see covering the trees arises from the same cause;—during the night a thick fog or vapor enveloped the earth, and towards morning a sharp frost setting in cooled every branch and spray, causing the vapor to condense and freeze upon them.

The earth, warmed by the heat of the sun, is constantly sending forth vast volumes of invisible steam or vapor, which may easily be proved by inverting a glass on the ground on a fine day, when, if the glass be kept cold, the inside will soon be covered with steam; indeed, the quantity is so great that 25 hogsheads of water will be evaporated from the surface of a square acre in 12 hours. It is this vapor, when condensed by any sudden change in the temperature, that produces fog. It may also be observed on a very warm day, producing a dazzling effect to the height of a few feet from the ground, resembling the vapor arising from a brick-kiln. It does not, however, appear to us in its moist form until condensed into dew by the chill of the evening.

Dew is, however, a very important natural phenomenon; and as it is the first and most gentle cause of the separation of water from the atmosphere, it is worthy of a good deal of attention. The subject of dew, and of the “dew-point,” or degree of temperature at which the atmosphere begins to part with moisture in the form of dew, collected upon surfaces with which it is in contact, are very important ones in the science of the weather. If the temperature is reduced to about 6° below the mean temperature of the place, the season, or the day, as the case may be, the air immediately in contact with the surface of the ground is no longer able to take up the vapor that radiates from it, or even to retain the whole of that with which it is already charged.

It was long a question, whether dew descended from the atmosphere or ascended from the earth; though, in strict language, dew can neither be said to ascend nor to descend, yet the water of which it is formed may be afforded by the earth, by the rain, or by both, the last of which is, I believe, pretty generally the case; still, however, there is a little vagueness in the theory, inasmuch as the electric state of the atmosphere may, and must, have some effect upon the formation of dew, and this is an effect which cannot easily be estimated. Looking at the facts, however, which are our best guides in such cases, we find that there is the greatest disposition to the formation of dew when the difference of temperature between the day and the night is the greatest. There is a greater proportion of solar heat reflected from the earth when the sun is near the horizon; the withdrawal of the reflection acts almost immediately after the sun sets; and so this cause, acting alone, or being the predominant one, occasions an evening dew, which forms in greatest quantity early in the night.

There is, however, another means of cooling the lower stratum of the air, the result of which is a dew which forms later in the night. This is produced by what may be called a night cooling of the air, arising not from the withdrawal of the sunbeam, but from the escape into the upper regions

of the air of that heat which radiates from the earth during the absence, as during the presence of the sun. If the air is clear: that is, free from clouds, this heat finds its way to an indefinite elevation, because the diminished density of the atmosphere offers less and less resistance to it as it ascends higher and higher. If, however, the atmosphere is clouded, the clouds arrest the upward progress of the radiated heat, and the retention of its action below the clouds prevents the lower atmosphere from tending to the requisite degree below the mean temperature for forming dew. Hence it is only in very particular states of the atmosphere that a thickly-clouded sky is attended with any formation of dew; and one may often observe that, when the night sets in cloudy and afterwards clears up, the ground will remain perfectly dry so long as the clouds are undissolved, but that a heavy morning dew will form after the sky becomes clear. Whatever increases the tendency of the air to receive the vapor of water must counteract the formation of dew; and hence there is seldom much dew in windy nights, even though the sky is without a cloud.

Dew, as we have now noticed, may be considered as the most perfect species of surface-clouds: that is, of clouds produced by the states of the earth and atmosphere at their immediate point of contact. But the formation sometimes extends to a moderate height in the air, and appears there in the state of visible vapor, or in what may be called a ground-fog. These ground-fogs are chiefly formed along the valleys of rivers which are surmounted by more elevated and exposed grounds. The cold wind from the latter descends after the diurnal influence of the sun upon it has ceased, and diminishing the capacity of the whole for moisture, produces a stratum, a sort of fog, which fills the hollows like water, and remains in the morning until it resolves into vapor by the heat of the sun. Such ground-fogs are more common in the autumnal months, but they appear even in summer in those situations where the formation of dew is frequent and copious. Sometimes the warmth and resistance of the earth are so great that there is less formation of dew accompanying the ground-fog than when no fog is apparent; and the electric state of the atmosphere is often so peculiar, that these fogs scarcely moisten a substance exposed to them, and thus they are what are called "dry-fogs."

That evaporation produces cold may be immediately proved by moistening the palm of the hand and exposing it to the wind, when cold will be very sensibly felt; and the more so if we use a volatile fluid, such as sal volatile or spirits of wine, the greater rapidity with which they evaporate producing a greater degree of cold. It is from this reason that remaining in wet clothes is so dangerous; the evaporation that takes place during the time they are drying, carries away so large a portion of heat from the body as almost certainly to induce cold, and all the thousand diseases will follow in its train. When a person is obliged to remain in wet clothes, the best method to adopt is to prevent evaporation by covering them with a mackintosh, or any other garment which will best keep in the moisture; and if this is effectually done, the person will feel little inconvenience from his damp clothes; the warmth of the body will soon communicate itself to the damp garments under the mackintosh, and as the steam cannot escape through it, there is nothing to produce a greater degree of cold than if the garments had been dry.

We may often observe, on a fine clear day, that the sky becomes suddenly overcast; and we wonder from whence the clouds have come; now this is most probably the effect of a sudden change of temperature, which has condensed and rendered visible, in the form of clouds, that vapor which before was floating unperceived in the atmosphere.

Southerly winds commonly bring rain, because, being warm, and replete with aqueous vapors, they are cooled by coming into a colder climate, and part with some of their vapor, which is precipitated in the form of rain; whereas, northerly winds being cold, and acquiring additional heat by coming into a warmer climate, are ready to absorb more vapor than they before contained, and therefore they are dry and parching, and commonly attended with fair weather.

Snow is nothing more than rain congealed in the higher regions of the atmosphere, before it has become dense enough to be formed into drops; and hail is rain, which, during its descent, and after having been formed into drops, passes through a stratum of very cold air which transforms the drops into ice. This cold stratum is often the result of an electric state of the atmosphere, and is frequently accompanied by storms of thunder.

The formation of ice, as it shoots its long, needle-like crystals from the margin of a shallow pool, is a very beautiful phenomenon, which, however, may be more agreeably examined at the fire-side by mixing a handful of salt in a dish of snow—the mixture producing extreme cold. If a saucer, partly full of water, be placed in the dish containing the salt and snow, it will rapidly congeal, even in a warm room, the only difference being that the crystals will shoot more from beneath than they would have done in a pond, from the freezing mixture being placed below the saucer.

Water is subject to a remarkable anomaly. There is a point in its temperature, about 40° in our common thermometer, at which it is most dense or compact, and from which it expands in heating till it becomes steam, and contracts in cooling till it becomes ice, which takes place at 32° . This is a beautiful provision of nature. By being less dense than water, ice floats on the top, and, by forming a hard crust, prevents the mass of cold liquid beneath from being greatly affected by the intensely cold atmosphere. Thus the lower stratum in lakes and rivers continues to maintain a temperature from 6° to 8° above the freezing point, and in this comparatively warm stratum fishes dwell as usual.

The boiling point of water is not fixed and definite like the freezing point. It is 212° at the level of the sea; but, in consequence of the diminished pressure of the atmosphere, becomes lower as we ascend, till, on a summit 15,780 feet high, it is 180° ; at the bottom of a mine 1650 feet below the level of the sea, water will boil at 216° .

It is through this liquid that all the active functions of vegetable and animal life are carried on. It is water alone that can act as the solvent for the various articles of food which are taken into the stomach, the gastric juice itself being nothing else than water with a small quantity of animal matter and a little acid, which form with the albumen, &c., of the food, new compounds that are capable of being dissolved in that liquid. It is water that forms all the fluid portions of the blood, that vital fluid which penetrates the minutest textures of the body, and conveys to each the appropriate materials for its growth and activity. It is water which, when

mingled in various proportions with the solid matter of the various textures, gives to them the consistency which they severally require. And it is water which takes up the product of their decay, and conveys them, by a most complicated and wonderful system of sewerage, altogether out of the system. No other liquid naturally exists in the animal body, save the oily matter of fat. It might be inferred, then, that water, in addition to properly selected articles of solid food, would constitute all that the wants of the system can ordinarily require; and there is abundant evidence that the most vigorous health may be maintained, even under very trying circumstances, without any other beverage.

"He that gives his mind to observe," says Bacon, "will meet with many things, even in vulgar matters, worthy of observation." Many of the operations of the kitchen are conducted on solid philosophical principles; but there is one of which the benefit is less apparent, although, from the universality of the practice, one is inclined to fancy there must be some advantage derived from it. I allude to the custom of placing an inverted cup in a fruit pie, as the cook will inform us, to contain the juice while the pie is baking, and prevent its boiling over; and she is the more convinced in her theory, because, while the pie is removed from the oven, the cup will be found full of syrup. When the cup is put in the dish it is full of cold air, which will expand by the heat in baking, driving out all the syrup and a portion of the air it contains, in which state it will remain till removed from the oven, when the air in the cup will condense and occupy a very small space, leaving the remainder to be filled with syrup; but this does not take place till the danger, of "boiling over" is past. If a small tumbler is inverted in the pie, its contents may be examined into whilst it is in the oven, and what has been advanced will be found correct.

In the manufacture of bread, the most curious part of the process is the action of the yeast. Flour contains a small portion of saccharine matter, the addition of yeast to which produces fermentation in the same manner that it does in brewing; during the fermentation carbonic acid gas is evolved. Now the glutinous nature of the dough will not allow this air to escape, but we find it pervading the whole mass in minute cells or bladders, forming it into a light spongy substance. The warmth of the fire has a double action, first, by increasing the inclination to fermentation, and secondly, by expanding the air in these small bladders, rendering the paste still more porous. The use of yeast, then, is to render the bread light by separating its particles. Knowing this, it is not difficult to substitute some other material to produce the same effect when yeast cannot be procured, and none is more efficient and simple than the mixture of muriatic acid and carbonate of soda, in such proportions as to neutralize one another when they form that useful article salt. The addition of this acid to a solution of carbonate of soda gives out carbonic acid gas; and as this mixture takes place in the dough, the gas pervades the whole mass in the same manner as if formed by the yeast. Ropy bread is generally admitted to depend on the presence of fungi; an eminent modern chemist ascribes its cause mainly to the yeast, aided by a particular state of atmosphere.

From a microscopic examination of yeast, it is found to consist of minute disconnected vesicles, that appear to constitute one of the simplest forms of vegetation. These, like seeds, may remain for any length of time in an

inactive state without losing their vitality; but when placed in a fluid where any kind of sugary matter is contained, they commence vegetating actively, provided the temperature be sufficiently high; and they assist in producing that change in the composition of the fluid, which is known under the name of "fermentation." If a small portion of the fermenting fluid be examined at intervals with a powerful microscope, it will be observed that each of the little vesicles, at first contained in it, puts forth one or more prolongations, which in time become new vesicles like their parents. These organs perform the same office, so that in a few hours the single vesicles have developed themselves into rows of five or six. Sometimes also the vesicles burst and emit a number of minute globules which are the germs of new plants, and which soon develop themselves into additional cells. By the time that five or six vesicles are found in each group, the fermentation is sufficiently far advanced for the purposes to which it is to be applied, and measures are then taken to check it, by which the vegetation of the yeast-plant is checked. Suppose, then, any circumstance to arise by which the vegetation of the yeast was checked, and the yeast amalgamated with the flour, for the vegetation again to become active, you will have a sufficient cause for the origin of fungi in bread.

The art of brewing, again, is based upon chemical data, and will bear the test of philosophical inquiry. Fermentation here is also the most important phenomenon, as the agent which transmutes the sugary principle of the malt from a mere syrup, as it may be considered when in the first state of sweet wort, into a spirituous liquor. A weak solution of sugar will of itself ferment, if kept in a warm place, as will also the sugar contained in grapes, and the saccharine matter of malt. In a general view of fermentation, therefore, we will leave out the small quantity of yeast employed, because it is not absolutely necessary, but seems merely to render the effect more rapid, and thus to prevent the change of the liquid into acidity. In complete fermentation the sugar disappears altogether, and two new substances are found in its place—carbonic acid and alcohol. The former escapes whilst the beer is left open, which may be easily tested by holding a lighted candle near the surface of a tub of beer whilst at work, when it will be quickly extinguished, proving also the deadly nature of the air. The alcoholic parts remain in the liquor. If too much of the carbonic acid is driven off before the cask is bunged down, the beer will become flat, and will be a long time before it acquires briskness. The use of hops in beer, besides the flavor they communicate, is to render it clear, and also a preventive to its becoming acid.

Atmospheric pressure is the weight of the air resting on the surface of the earth. Air extends to a height of many miles above the earth; and although but a light fluid, yet so great an altitude of it must be of considerable weight. Were we to take a square tube, one inch in diameter, and so many miles high as to reach to the top of the atmosphere, the air in that tube would weigh about 15 lbs.; therefore, every superficial inch of the earth's surface is pressed upon by a weight of 15 lbs. Now air, being a fluid, presses in all directions alike; consequently, every surface which is exposed to its action, whether it be horizontal or perpendicular, is subject to this pressure. If we place our hand over the open receiver of an air-pump, and exhaust the air from beneath, we should very quickly be made

painfully sensible of this pressure. But a more simple experiment, to show the weight of the atmosphere, may be made in the following manner: Fill a wine-glass with water, and cut a piece of writing paper nearly to fit the top of the glass; lay the paper on the glass, which should be quite full; then placing the palm of the hand over the paper, gently invert the glass, and hold it bottom upwards. The hand may then be removed, and the paper will be pressed against the mouth of the glass by the atmosphere, so as to prevent the water from escaping.

The common pump is a most useful application of this pressure to domestic purposes. As before stated, every inch of surface supports a weight of 15 lbs. Now if we can remove this 15 lbs. from one inch of the surface of the water in a well, whilst we allow the pressure to remain over the other part, it follows that the water will be forced up in the part from which the pressure is removed; and if the water so forced up be enclosed in a tube an inch square, we shall find that it will rise in this tube till the quantity contained in it will weigh 15 lbs., which would require an altitude of 33 feet, the weight of water in the tube being equal to the weight of air on a similar surface of water in the well. The pump is an instrument for removing this pressure of the atmosphere from the pipe. Every time the piston is raised it lifts the weight of the atmosphere resting upon it, removing its weight from the water in the pipe; the water from the well, therefore, follows up the pipe to fill the parts from whence the pressure is removed, and there is a valve or small door at the bottom of the pipe, which prevents the water returning into the well as the piston descends;—every fresh stroke of the pump is followed by a fresh supply of water.

The foregoing example of atmospheric pressure seems naturally to lead us to the barometer, an instrument contrived for the purpose of ascertaining the variations of this pressure; for though we have stated it at 15 lbs. per inch as its mere weight, it is subject to constant variation with every change of its atmosphere. The barometer is a glass tube about 33 inches long, filled with quicksilver, and inserted in a cup containing the same, the air being allowed to press on its surface, as it did on the water in the well—the weight of air being removed from the quicksilver in the tube by the upper end being closed. The mercury will now be supported in the tube to a height equivalent to the weight of the atmosphere. This, as before stated, requires 33 feet of water; but as mercury is $33\frac{1}{2}$ times heavier than water, it will rise about 30 inches only. When the atmosphere is heavy it presses with more force upon the surface of the mercury in the cup, forcing it higher up the tube; whereas, when the atmosphere is light, the pressure is relieved and the mercury falls.

There can be no doubt that the primary agent in the production of these atmospheric fluctuations is heat. This influence, from various causes, is very unequally distributed. It affects the weight of the atmosphere by expanding its volume. When this spreading takes place in the air over any particular part of the earth's surface, the diminished pressure on the exposed portion of the mercury in a barometer will, of course, be shown by the diminished elevation of that in the tube. But it will occasion other effects also in the air itself. The more condensed air from distant places will soon begin to rush with more or less violence towards the situation of diminished pressure: in other words, wind will occur. But the increase

of heat has also been occasioning a more rapid and plentiful evaporation of moisture from the earth, which, rising into the air in the form of invisible vapor, has of course produced more than the usual accumulation there; and is, therefore, ready to fall again to the earth as soon as the reduction of temperature has taken place. Hence, in such circumstance, the occurrence sometimes of mist or dew, at other times of rain, or snow, or hail. The process, in short, is this: The heat operating in the air, dilates it, diminishes its weight, and consequently lowers the mercury in the barometer; operating upon the terrestrial moisture, raises it by evaporation into the air, which soon becomes charged with more than its usual humidity. Then come the wind, the fall of temperature, and the rain, &c. A fall in the barometer, accordingly, is found by experience to be, in general, an indication of all these coming changes. By inverting an empty wine-glass into a tumbler of water, and forcing it down, the air in the wine-glass will prevent the water from entering it more than a little way up the mouth, thus showing the power of resistance the atmosphere is capable of exercising, a fact we are apt to lose sight of from the ease with which we move about in it. It is upon the principle of air excluding the entrance of water that the diving-bell is constructed.

The effects of the pressure of water was very curiously exemplified a few years ago, by some gentlemen who were trying experiments on water brought from different depths of the ocean. For this purpose they corked up and lowered an empty bottle into the sea, imagining that, when the pressure was sufficient, it would force the cork into the bottle, and that the bottle would fill so as to bring them a specimen of water from that depth; but what was their surprise on finding it still corked although full of water! They conjectured that the water had forced its way through the cork; and to prevent this, they sealed the cork of the next bottle. On pulling this up, however, the mystery was solved,—the bottle was found to be full and corked, as before, but the cork was reversed, and forced into the neck of the bottle with the sealed end inside. This curious fact was thus accounted for: As the bottle descended the pressure drove the cork in and filled the bottle; the weight of the sealing-wax on the top of the cork caused it to reverse its position, and float with the sealed end downwards. When the bottle was drawn up, the pressure being diminished, the water, or perhaps more properly speaking, the small portion of air contained in the water, expanded, and forced the cork again upward into the neck of the bottle. All this appears simple enough when explained, but it required a good deal of consideration on the part of those who first witnessed the experiment.

Early in my paper I drew your attention to certain objects of interest occurring in a morning walk. It was my intention to have closed it by noticing a few of the phenomena observable during a stroll on a summer's evening, such as the refraction of the rays of light, in connexion with the setting sun, our lengthening shadows, which source would have suggested a cursory remark or two on the cause of lunar eclipses. Then the cause of, and various circumstances attendant upon, thunder storms, might have been not inaptly introduced, which again would have naturally led to the subject of "sound." But having already reached the prescribed limits as to time, I must bring my notes to a hasty conclusion.

The acquirement of knowledge consists in the registry of *facts* in the mind ready to be applied as they may be required; and it is this faculty of applying facts thus gained in the brain which constitutes wisdom. Bacon has justly observed that, "the man who writes, speaks, or meditates, without being well stocked with facts as landmarks to his understanding, is like a mariner who sails along a treacherous coast without a pilot, or one who adventures on the wide ocean without a rudder or a compass." The mere possession of knowledge may be only the work of a good memory, and serve but little purpose without wisdom to apply it to good account. It may be compared to a huge folio volume without an index, full of valuable information, but useless to its possessor at the moment it is required, from the want of arrangement and the means of arriving at its contents. To those who pass through the world, as many do, without a wish even to increase their knowledge, or to examine into the wondrous works of nature, satisfying themselves with the opinions of others, seeing with other men's eyes, and reasoning with other men's faculties; to such persons I would say, in the language of Locke, "that he who examines, and, upon a fair examination, embraces an error for the truth, has done his duty more than he who embraces the profession of the truth without having examined whether it be true or no." Nor need we fear that a man of an inquiring mind will ever be puffed up with vanity and self-conceit; for the more he sees and observes, the greater will his admiration of the goodness of his Creator become, and the more humble his opinion of himself, because he is always reminded that his faculties are finite, whilst the God whose works he studies is infinite.

The lecturer having concluded, a vote of thanks was unanimously given to Mr. Chapman, for the very able and comprehensive manner in which he had treated his subject.—*Derbyshire Courier*.

Report made to the Committee of the Blockley Almshouse, on Warming and Ventilating the Lunatic Asylum, (Female Department.) By BIRKINBINE, MARTIN & TROTTER, Philadelphia.

GENTLEMEN: In compliance with the resolution passed by your Committee, February 13th, 1850, and communicated to us by your Secretary, we would submit the following Report on Warming the west half of the Lunatic Asylum of Blockley Almshouse by steam, and Ventilating the same, which we have just completed.

The main features of the arrangement are the same as those embodied in our plans submitted to your consideration in February last. Much difficulty was experienced in the adaptation of an old edifice, not originally designed for such a system as has been adopted, and which added greatly to our labor, and made it more difficult to effect our purpose.

In constructing the heating chambers and necessary flues, we were obliged to cut through a system of arches, which, on account of the substantial manner in which the building was constructed, added greatly to the expense and time attending the prosecution of the work. The want of proper flues and conduits for the warmed and extracted or foul air, all of which we were obliged to construct or alter to answer the purpose of

the present arrangement; the insufficient height of the cellar ceiling for our purposes, and the impossibility of going any deeper on account of water, presented another serious difficulty in the great distance the steam has to be conveyed, and the condensed water returned again to the boilers, being 500 feet; a greater depth would have facilitated the return of the condensed water.

Running underneath the building are a number of sewers, into which the sinks are drained, consequently making them very foul. These made a system of ventilation very desirable, but at the same time greatly interfered with our efforts to produce a pure atmosphere throughout the building. The building itself is one very difficult to warm, on account of the great height of the ceilings, the first story being $14\frac{1}{2}$ feet, the second $16\frac{4}{5}$ feet, and the third $14\frac{8}{10}$ feet in height. The number and large size of the windows making the glass surface equal to 3447 square feet, and the imperfect fitting of the windows, together with the large size of the doors, and the very exposed situation of the building, render it, perhaps, more difficult to warm than any of the buildings connected with the Institution.

Our contract with you was closed on the 13th day of February, 1849, when we immediately commenced the necessary excavations and cuttings. The work was continued without interruption (except when the cholera was raging in the house) until the fire was made, on the 26th day of October last. The apparatus has warmed the building to the present time, nor has the fire ever been drawn out.

By the assistance of the accompanying drawings you will more readily understand the arrangement of the building, and the warming and ventilating apparatus.

Fig. 1, Plate III., is a plan of the west half of the Lunatic Asylum; the main building, running east and west, is 168 feet long by 59 feet wide, inside measurement; three stories high, with an attic. On each floor of the main building there is a large hall running the length of it, a stair-way, kitchen, dining-room, and three large associate rooms, in each of which there is a nurses' room, wash-room, and water closet.

The wing at right angles to the main building is 119 feet long by 46 feet wide, inside measurement; three stories high, with an attic. On each floor of the wing there is a hall running the length of it, and connected with the main building by another hall; two stair-ways, a nurses' room, a bath-room, two associate rooms, and twenty cells.

Great pains have been taken to procure air for the supply of the house from pure sources, and to keep it from being contaminated while in the equalizing and heating chambers under the building. The arrangements are such that the patients cannot interfere with them in any way; there are no valves in any of the flues except those in the hall, nor have they been found desirable, as there is but a trifling difference in the temperature of the different parts of the house, thus avoiding the consequent annoyance from interference with them.

The heating chamber, (AA, fig. 1,) for warming the main building, runs along the centre of the cellar, until within 23 feet of the wing, where it was found necessary to stop on account of a sewer crossing it at right angles. For warming the halls in the main building, another chamber (B) is constructed. For warming the cells and halls in the wing, the heating chamber (A') runs the length of the wing, at right angles to the main

chamber. For warming the associate and nurses' rooms, the chambers (A'' A'' A'') are constructed.

The air for supplying the main building is drawn from the garden on the south side into equalizing chambers, (L L L,) and from thence through the small apertures (O O O, &c.,) in the bottom of the chamber wall, as indicated by the arrows, (fig. 4,) into the heating chamber (A), where it is heated, and then distributed through the flues (F F F, figs. 3 4 and 5,) into the different parts of the house to be warmed.

The air for supplying the cells and halls in the wing is drawn from the enclosure on the west side of the building. It is received into a shaft (S) sufficiently high to be beyond the reach of the patients who may be exercising in the yard;—conveyed down this, and through a tunnel 50 feet in length, into the heating chamber (A'), where it is heated, and from thence distributed into the cells and halls.

The associate rooms in the wing receive their supply of air from the garden, and the nurses' rooms from the yard. Their arrangements for the equalizing and heating chambers, flues, &c., are the same as the others.

The arrangements by which the heated air is introduced, and the foul air extracted from the rooms, will be understood by referring to figs. 3, 4 and 5, which represent the arrangement for warming and ventilating three of the large associate rooms in the main building, which are each 47 by 44 feet. The flues (F F F) lead from the heating chamber (A) to near the ceiling in the centre of the rooms; these supply the heated air for warming the rooms, throwing it out in the directions as indicated by the arrows.

The foul air is drawn off by means of the foul air flues (V V) placed in the sides of the rooms, opposite to the entrance for warm air; they open close to the floor, thus producing a downward ventilation. Through these it is conducted to the main foul air flue (K K, fig. 4, 5); from thence conducted to the extracting shaft (E), which is 90 feet high, fitted with a cast iron chimney (P), 30 inches diameter and 25 feet high, through which the smoke and gases from the fire are discharged. The extracting shaft is also fitted with a steam jet, by means of which additional force can be given to the ventilation if it should be desirable. There is also a small furnace in the base of the shaft, so arranged as to produce ventilation when the heating apparatus is not in use.

The main sewer, which runs under the building, is so connected with the fire under the boiler that the necessary air for supplying the furnace may be drawn from it, thus creating a current of air into the sewer, and, in a measure, preventing the escape of fetid gases.

G G, figs. 1 and 2, are two cylindrical boilers, 36 inches in diameter and 40 feet long, having a capacity, together, equal to 565 cubic feet. We would here assure you of the perfect safety of these boilers. They are constructed of the best Pennsylvania iron, by experienced workmen, and are of unusual thickness; the heads, although of cast iron, are concave; the boilers weigh together 12,186 lbs.; the great amount of water they contain, and consequently the amount of time necessary to evaporate it, makes them safe as regards explosion from the most frequent cause, the want of water; and their proportion in relation to the fire and radiating surfaces is such, that, were the safety valves chained down, it would be impossible to generate a pressure of 100 lbs. to the square inch. With the present weight at the extreme end of the safety valve levers 72 lbs. pressure would raise

them. The boilers will sustain a pressure of 300 lbs. to the square inch without any danger; 30 lbs. is the greatest pressure under which the apparatus is generally worked.*

The smoke and gases from the furnace are conveyed through the smoke flue (D, figs. 1 and 2,) within the heating chamber (A), until it is opposite the extracting shaft (E); from here it is conducted across and into the cast iron chimney (P) within the extracting shaft (E). The smoke flue within the heating chamber (A) is covered with cast iron plates, and these with clean sand. The arrangements are such that the temperature of the smoke and gases is reduced below 200° Fahr. before they are permitted to escape; thus preventing any unnecessary waste of heat, and consequently of fuel.

To the boilers are connected, by means of a 6-inch cast iron main (R), systems of radiating pipes (*h h h*) of wrought iron, $\frac{3}{4}$ -inch inside diameter; they are distributed through the different heating chambers (A A' A'', &c.) These systems are so arranged that the condensed water is returned to the boilers, to be again converted into steam, thus producing a circulation. There are between 8000 and 9000 feet of radiating pipe distributed through all the heating chambers.

If a rapid circulation through the radiating pipes is desired, for the purpose of raising the temperature of the building in a comparatively short time, it is effected by opening a blow-off cock which discharges into a sewer, or by means of a steam pump, so arranged as to take the water from the condensed water pipes and force it into the boilers. This pump is also used for supplying the boilers with water when the pressure of steam is too great to do so from the reservoir.

In the third story of the wing is an iron tank, of a capacity of 1200 gallons, in which the water for washing and bathing purposes is heated by means of a coil which is supplied with steam from the boilers (G G), a distance of 200 feet.

The boilers also supply the steam for cooking the food for the inmates. In the kitchen are two boilers of 95 gallons each, and one of about 50 gallons; in these the food is cooked. The kitchen in the eastern or male part of the house is arranged in the same way. They are all supplied with steam from the same source.

There is no fire in the west half of the Asylum excepting under the boilers (G G), and a small cooking stove for preparing food for the sick.

The cubical contents of the building warmed, without deducting partition walls, stair-ways, &c., is 780,000 cubic feet; the amount actually warmed by the apparatus, deducting partition walls, stair-ways, &c., is 730,000 cubic feet, or 90 rooms and 6 halls.

The consumption of fuel in cold weather is $1\frac{1}{2}$ tons of coal per day (24 hours); allowing 75 days cold and 100 days moderate weather through the winter, the consumption would be 213—say 225 tons; 30 tons of this should be deducted, which is the amount used in cooking, and 15 tons of this should be charged to the eastern or male part of the house. The consump-

* Plain cylinder boilers are always preferable to tubular boilers where there is room enough to make them sufficiently large,—they can be made stronger on account of their form; they have, also, more steam and water room. The boiler of a first class locomotive, of ordinary construction, will generate enough steam, when the fire is in full operation, to fill the steam space in four seconds; and enough, could there none escape, to burst the boiler in about ten minutes;—they will evaporate the water so as to become dangerous in from 30 to 60 minutes when the supply of water is stopped.

tion of fuel, as near as we can ascertain, for heating this part last year, by close stoves, &c.,—and there was no ventilation—was from 275 to 300 tons of coal—say 275 tons—when but a portion of the rooms were warmed, and that imperfectly;* while, by the arrangement introduced by us, the whole of the building is warmed at a saving of at least 75 tons of coal, which, at \$4 per ton, would be \$300.

The advantages of the present arrangement are,—

1st, Producing a pure atmosphere throughout the building, the air being supplied in great abundance from pure sources, and so arranged as to keep it from contamination.

2d, A system of downward ventilation, which diffuses the warmth uniformly throughout the various apartments; the air being admitted near the ceiling and drawn off at the floor, is constantly sinking, and in this way the colder and impure air passes off by the foul air flues, and is ejected from the extracting shaft above the building.

3d, The safety from fire, both in the building and as regards the patients, which, in a Lunatic Asylum, is a very important consideration.

4th, The freedom from noise, dust, and dirt, usually attendant upon fires in grates and stoves.

5th, The whole heating arrangement being under the care of a single individual, is more easily managed than by a number of attendants, who are now dispensed with.

6th, The economy of the arrangement, saving about 25 per cent. in fuel;—the repairs will not exceed those of stoves and grates.

Explanation of Plate III.

Fig. 1.—Plan of Building, and Warming and Ventilating.

Fig. 2.—Elevation of Heating Chambers.

Fig. 3.—Longitudinal Vertical Section of the Arrangement for Warming and Ventilating.

Fig. 4.—Plan of a part of the Heating and Ventilating Chamber.

Fig. 5.—Elevation of Fig. 4.

Philadelphia, February 26, 1850.

For the Journal of the Franklin Institute.

Accident on Board the Steamer "Niagara," at Bridgeport, Connecticut.

Report of a Committee of the "Wacamahaga Club."

Your Committee, to whom was referred for examination the cause of the recent accident on board the steamer "Niagara," at Bridgeport, have performed the duty assigned them, and Report:—

That the accident which occurred was a separation of the main steam

* Some idea may be formed of the imperfect manner in which it was heated last year, by the following situation of the wing:—

Feb. 17, 1849.—At 9 o'clock, A. M., towels froze directly after washing the patients.

At 2 o'clock, P. M., thermometer stood at 28° in the building.

During the night, thermometer stood at 32° in the building.

Feb. 19, 1849.—Three feet from the stove, the thermometer stood at 32°.

At 9 o'clock, A. M., thermometer stood at 28° in the light cells.

At 2 o'clock, P. M., the same.

At 7 o'clock, P. M., the time for putting the patients to bed, the thermometer stood at 30°.

By the present arrangement in the same wing,—

Feb. 6, 1850.—At 9 o'clock, A. M., outside 16°, inside 62°.

12 " M. " 15°, " 60°.

3 " P. M., " 15°, " 60°.

Before the arrangements for this wing were entirely completed.

Fig. 3.

Elevation.



Plan.

Fig. 4.

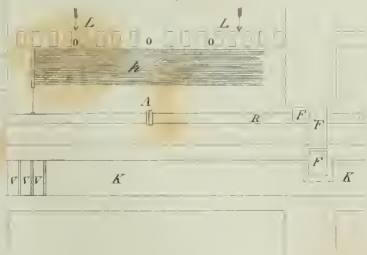


Fig. 5.



Fig 1

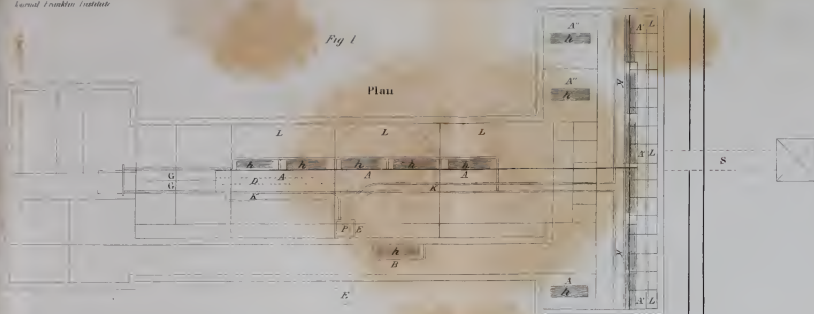


Fig 2

Elevation

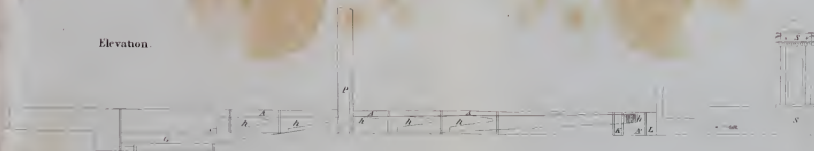


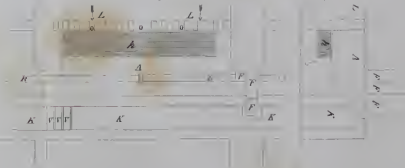
Fig 3

Elevation

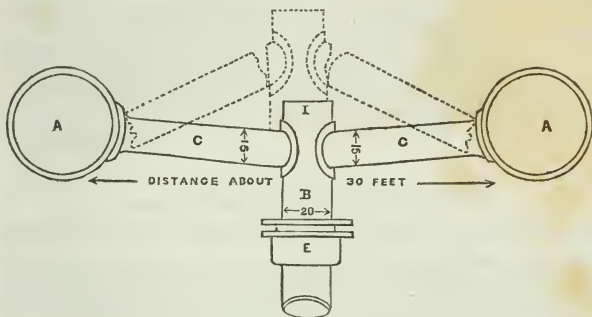


Plan Fig 4

Fig 5



pipe at the "slip-joint," whereby the whole quantity of steam, and a large portion of the water contained in the boilers, was discharged upon the upper or hurricane deck of the boat. The subjoined sketch shows the arrangement of the pipes, and will aid in explaining the cause of the accident.



The two boilers are upon the guards of the boat, and their steam chimnies are represented at A A, the distances asunder being about 30 feet; the main steam pipe, B, is about 20 inches diameter, and the branch steam pipes to the steam chimnies about 15 inches diameter. The slip-joint which separated is represented at E.

The branch steam pipes, C C, ran nearly in a direct line across the vessel, but having a slight angle towards the engine, as shown in the sketch. When the accident took place, the pipes were thrown forward, and the flanches were torn asunder, as shown by dotted lines.

It is understood that, at the time of the accident, there was a pressure of about 20 lbs. per square inch above the atmosphere upon the boilers, and there was no provision whatever to guard against the action of the steam upon the end of the main steam pipe at I, other than the stiffness of the cross pipes C C, and the friction of the slip-joint itself. The pressure upon the end of the pipe, tending to separate the slip-joint, at the pressure named, (20 lbs.,) is $20^2 \times .7854 \times 20 = 6283$ lbs., and with 40 lbs. pressure per square inch, would be 12,566 lbs. The last named pressure has often been carried upon the boilers of our steamboats, and it is fair to infer that this pressure might at times have been carried upon these boilers.

We have already observed that the only resistance to this pressure of 6283 lbs. was the stiffness of the pipes, and the friction of the packing in the slip-joint; but it is also to be remarked that the accident occurred directly after raising steam in the morning, and it is probable that the packing of the slip-joint had not yet expanded by heat and moisture, so as to produce the usual amount of friction, and hence the only resistance to this pressure, at that time, was the stiffness of the cross pipes, and this we consider quite inadequate for safety.

In conclusion, we would state that we consider the accident attributable entirely to a want of some guard against the reacting pressure upon the

main steam pipe, other than the stiffness of the branch pipes, and are of the opinion that this oversight shows a want of thought on the part of those fitting out the boat.

It is with pleasure that your committee state that no person was seriously injured.

The committee are cognizant of other accidents having occurred by the separation of slip-joints in a similar manner, by which there has been loss of life. They would earnestly call the attention of engineers to the necessity of greater caution in guarding against accidents of this character than is generally shown in the arrangement of pipes on board steamers.

By order of the Club.

OTIS, *Secretary.*

Translated for the Journal of the Franklin Institute.

Effects of Atmospheric Electricity upon the Wires of the Magnetic Telegraph.

The *Revue Scientifique*, for December last, (Tom. xxxvi., p. 436,) contains an interesting article by M. Baumgartner on the subject of the effects of atmospheric electricity upon the wires of the magnetic telegraph. The following are the most interesting of his results:

1. The needle rarely coincides with the point which is determined by its astatic state and the tension of its suspension thread; almost always it deviates more or less from this point; which proves that it is influenced by an electric current.

2. The variations are of two kinds; there are some which reach 50° , others extend over $\frac{1}{2}^{\circ}$ or $8'$. The first are less frequent; they differ so often in direction and intensity that it is impossible to deduce a law for them. On the contrary, the small deviations appear connected by a very simple law.

The observations made at Vienna, and at Gratz, appear to shew that, during the day, the electric currents move from Vienna, and from Gratz, to Semmering, which is more elevated. This direction is inverse during the night. It appears that this change of direction takes place after the rising and setting of the sun.

3. The regular current is less disturbed by the irregular currents when the air is dry and the sky is serene, than when the weather is rainy.

4. In general, the current is more intense with short than with very long conductors; often, even, the current of the longer chain is opposed to the current of the shorter chain.

Where there is a difference of intensity, this difference is far greater than that which could originate from the resistance of the longer conductor.

When the sky is cloudy, and the weather stormy, there are frequently observed in the electric conductor, currents which are sufficiently intense to affect the telegraphic indicators, which are, however, far from having extreme sensitiveness.

When they were placing the conducting wires of the Northern Telegraph line, from Vienna, the workmen frequently complained of a kind of spasms which they felt in handling the wires. These spasms ceased as soon as they took the precaution not to touch the wires with naked hands.

These spasms were most frequent and intense in Styria, the highest region of the line. Thus, near Kranichfeld, a workman received a shock sufficiently violent to overturn him and paralyze his right arm.

The action of the atmospheric electricity on the telegraphs is stronger on the approach of a storm, and not unfrequently the wires themselves, and the poles which support them, are destroyed by electric discharges.

M. Baumgartner cites several examples in support of what has just been said. On the 17th August, 1849, a storm which had burst forth at Ollmutz extended to Frielitz: that is to say, to a distance of 10 miles. A workman employed at this latter station, in putting up the wires, experienced a shock which overturned him, and he experienced a real burn of the fingers which touched the wire. At this time the sky was perfectly serene at Frielitz.

For the Journal of the Franklin Institute.

Steamers "Ohio" and "Georgia."

In a late number of the Journal, I gave all the particulars of the steamer "Ohio," running in Laws' Chagres Line from New York; and I then stated that the "Georgia," then unfinished, would have a duplicate set of engines and boilers, but the model would be quite different. That difference and its advantages I will now show.

	Ohio.		Georgia.	
Length on deck,	247 ft.	10 in.	248 ft.	8 in.
Breadth of beam,	45	7	48	8½
Depth of hold,	24	6	25	6
Midship section from stern-post on 16 ft. water line,	122	0	104	9
Draft with engines on board, and boilers filled with water,	13	10	12	0
" with 500 tons coal in,	16	6	14	0
" with 200 tons freight, with water and stores for voyage,	17	2		
" with 771 tons coal in, and 200 tons freight, and stores and water for the voyage,			16	3

From the above it is readily seen that, carrying 271 tons more coal, the "Georgia" draws 11 inches less water, while, in speed, she is acknowledged to be the fastest vessel. By carrying her midship section aft, they have been able, notwithstanding her increased width, to get easy lines forward, while her after lines are not made too full. B.

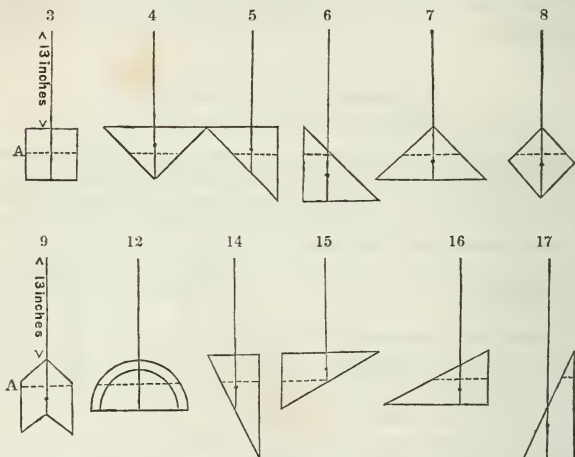
For the Journal of the Franklin Institute.

Remarks on T. Ewbank's Experiments on Paddle Wheels.

In the January and February numbers of the Journal, 1849, Mr. Ewbank published the result of his experiments on paddle wheels, and deduced therefrom certain theories in relation to them, which, to me, appeared so erroneous that, in the March number, I stated my objections. Since then, Mr. Ewbank has become Commissioner of Patents, and, in his annual report, has introduced the same experiments with the same conclusions. As I differ with him entirely as to the results obtained, it is my present pur-

pose to again recur to his experiments, and to prove (in my own opinion at least) that whatever the experiments made by Mr. E. do demonstrate, it is not the advantage of using triangular paddles. I wish here to be understood that I do not assert that no advantage will be gained by their use, if properly made, but simply to show that the result of the experiments made by him was to prove that the wheel having the largest effective diameter (both making the same number of revolutions) had in all cases the advantage.

These diagrams give nearly all the experiments of Mr. E., those left out not being important. I have affixed the same numbers to the paddles, to



prevent confusion in referring to the original article. No. 3 was the trial paddle, and was 7 inches square. In *all* these experiments, the paddles had the same area, (49 inches,) and the *inner* edge of all the paddles was the same distance (13 inches) from the centre of motion. The wheels were both attached to one shaft, and made the same number of revolutions, the paddles of the trial wheel were No. 3, and they remained unchanged throughout the experiments. The dotted line, A, shows the centre of the trial paddle, and the small dot in the other paddles shows their centre, and the difference between the two can readily be seen.

Mr. E. remarks that Nos. 4 and 15 were unable to compete with No. 3; No. 5 was slightly superior to No. 3, and the superiority of all the rest was very evident; and he then adds that it is made manifest by paddles 7, 12, and 16, (when 4 paddles were found equal to 8 of No. 3,) that *triangular* paddles, having equal *area* and *dip*, may be rendered *twice* as effective as the ordinary rectangular one. I think it will be evident to all who read this article, that it is not necessary to experiment in boats to prove the superiority of Nos. 7, 12, and 16; the effective diameter of No. 7 is

35 inches, and of No. 16 is 36 inches, being 2 and 3 inches greater than No. 3. Mr. Ewbank must be well aware that each of his paddles said to be superior to No. 3, from the increased diameter of their effective centres, would require more power; and it yet remains to be demonstrated that triangular paddles have any advantage over the ordinary rectangular form.

As to reducing the number of paddles, every engineer, for the past 20 years, has been well aware that they could take out one-third or one half of their paddles, and go as fast as with them all,—perhaps in some cases faster; but the present number is used to produce a uniform and regular motion to the vessel. But, even in this respect, Mr. E.'s experiments do not justify *his* conclusions, for, in all his experiments, the best result was obtained with EIGHT paddles; the distance from centre to centre was but about 12 inches, while in all steamboats it exceeds 3 feet. He says that 4 paddles of Nos. 7, 12, and 16, were equal in effect to 8 of No. 3, but at the same time he shows that 8 of either of those kinds was superior to 4.

No. 12, in his experiments, is not correctly described, for he says it has the same dip as No. 3, and is a semicircle. If so, it would be one-half of a 14-inch circle, and contain 72 instead of 49 inches; and if, as I suppose, it contained but 49 inches, and was still a semicircle, it is shown by the inner line, and is one-half of a $11\frac{5}{8}$ circle. B.

For the Journal of the Franklin Institute.

Steamship "Baltic."

This vessel, the fourth of Collins' Line of Liverpool Steamers from New York, was recently launched from the yard of Jacob Bell. Her dimensions are as follows:

Length on deck,	285 feet.
Breadth of beam,	46 "
Depth of hold,	32 "

She is to have two side lever engines, with cylinders of 95 inches diameter, and 10 feet stroke.

Translated for the Journal of the Franklin Institute.

Process of Engraving upon Ivory.

The process used to cover ivory with ornaments and designs in black, consists in engraving in the ivory itself, and then filling in the designs with a black hard varnish.

To obtain finer and more regular designs, the ivory is to be covered with the common ground, and by means of the point the designs are engraved upon it. They are then eaten in by a solution formed as follows:

Fine Silver,	6 grammes.
Nitric Acid,	30 "
Distilled Water,	125 "

At the end of about a half-hour, according to the depth to be given, it is to be washed with distilled water, and dried with bibulous paper. The

design is then exposed for an hour to the solar light, and the layer of wax is removed by essence of turpentine.

The design has then a black color or a dark brown, which blackens entirely at the end of one or two days. Other colors may be produced, by replacing the solution of nitrate of silver by a solution of gold or platina in aqua regia, or of copper in nitric acid.—*Revue Scientifique*, xxxv, p. 433.

For the Journal of the Franklin Institute.

Steamship "Atlantic."

This is the first of Collins' Line of Liverpool Steamers, and she is now rapidly approaching completion. Steam was first applied to her engines on the 2d inst., and they were found to be all right. Much credit is due Messrs. Stillman, Allen & Co., of the Novelty Works, by whom the machinery has been constructed; it has every appearance of strength, and is exceedingly well finished. The engines are of the side lever arrangement, with cylinders 95 inches diameter, 9 feet stroke.

Translated for the Journal of the Franklin Institute.

Memoir on the Perturbations Produced in the Vibratory Movements of a System of Molecules by the Influence of another System. By M. AUGUSTIN CAUCHY. (*Academy of Sciences of Paris*, Jan. 14, 1850.)

There is, perhaps, no student of the present day who has carried his mathematical speculations farther, or has been more happy in their application to physical phenomena, than M. Cauchy. In the memoir whose title is given above, after recalling to the minds of his fellow academicians the differential equations which he had deduced for the expression of the conditions of equilibrium and motion of a system of material points, (equations which he had shewn to be applicable to the theory of elastic bodies and of sound, in 1827, and had applied to the phenomena of light in 1829,) he has now conceived the case of a homogeneous system of atoms, brought into presence of another system, also homogeneous among themselves, but differing from the first, and has proceeded to investigate their material influence.

After developing the mathematical conditions of the atoms, he proceeds as follows:—"Starting from this principle, we see that the actions exercised upon the atoms of the ether, (the medium by the vibration of whose particles the phenomena of light are supposed to be produced,) by the molecules of bodies, produce in the vibratory movements of the luminous fluid perturbations similar to those which the movement of a planet around the Sun, undergoes, by virtue of the action exerted upon it by another planet. Let us enter into some details upon this subject.

"If a single planet be supposed to move around the Sun, the orbit which it will describe will be a plane curve, an ellipse in which the radius vector, drawn from the planet to the Sun, will describe areas proportional to the times. This ellipse may, moreover, in certain circumstances, be reduced to a circle, or flattened indefinitely."

"If, now, we suppose a second planet moving around the Sun, it will produce, in the movement of the first, inequalities or perturbations of two kinds, to wit, periodic inequalities, which will disappear at equi-distant epochs without modifying the elements of the ellipse described, and secular inequalities, which will sensibly alter the elements of the elliptical movement."

"Now these different phenomena are re-produced on a small scale in the theory of light. Let us consider the vibratory movements of the ethereal fluid. If this fluid be isolated, its vibrations may be represented by linear equations with constant coefficients, and then each molecule will describe a plane curve. In the most frequent case this plane curve will be an ellipse, and the radius vector drawn from the centre of the ellipse to the molecule of ether will describe areas proportional to the times. We shall then get what is called *elliptical polarization*. This ellipse may, moreover, in particular cases, transform itself into a circle or flatten itself indefinitely, so as to be reduced to its major axis, and then the elliptical polarization will be transformed into *circular* or *rectilinear* polarization. We may add also, that, in every luminous movement which is not extinguished for increasing values of the time, or of the distance from a fixed plane, the ellipses described by the different molecules of the ethereal fluid will be all similar, and comprised between parallel planes."

"Now let us conceive that the ether set in vibration is enclosed in another body, for example in a crystallized medium. The curves described by the molecules of the ether will be still nearly plane curves, and even ellipses. But the elements of the elliptical movement will be no longer the same as in the case where the ether was isolated. Besides, the perturbations produced in the elements of the elliptical movement will be of two kinds. The one analogous to the periodic inequalities of the planetary motions will be themselves periodic; only they will be represented by periodic functions, not of the time, as in astronomy, but of the coordinates of the atom. If, moreover, the vibratory movement of the ether is not one of those which are destroyed by the increasing values of the time, or of the distance from a fixed plane, then, in passing from one atom to another, two elements of this vibratory motion will remain invariable, viz., *the length of a luminous undulation*, or, in other words, *the breadth of a plane wave*, and *the time of vibration*. As to the perturbations which are not periodic, they will be analogous to the secular variations of the planetary movements, and will alter the two elements of which we are speaking."

"I will add here an important remark. The greater part of the phenomena which the theory of light presents, as, for example, the propagation of luminous waves in singly or in doubly refracting media, the dispersion of colors produced by the prism, the diffraction of the rays transmitted through a small opening, the reflection and refraction produced by the surface of a body, may be deduced from the integration of the linear equations with constant coefficients; and, in truth, I had already succeeded not only in deducing them, but also in determining from the calculus the laws of these phenomena, with such success that the predictions of the analysis have been heretofore confirmed by experiment. There were, nevertheless, some other phenomena remaining unexplained, particularly the chromatic polarization produced by certain liquids, such as the oil of turpentine and

tartaric acid, or by these liquids solidified, as the beautiful experiments recently performed by M. Biot shew. Now the principles which I have first laid down permit me to connect these remarkable phenomena with the direct actions exercised by the molecules of the bodies upon the atoms of the ether, and with a particular distribution of these atoms, determined by these same actions. This I will explain more in detail in another article."

"I will remark, in conclusion, that the same principles also furnish the explanation of the difference which exists between the velocity of sound given by the Newtonian formula and the velocity derived from experiment."*

For the Journal of the Franklin Institute.

Experiments on Paddle Wheels.

The experiments being made on board the steamboat "Penobscot" with concave paddles, and alluded to in the last number, have been continued. So far, the new paddle is 10 per cent inferior to the old rectangular floats taken off.

Report of the Explosion of the Locomotive Engine "Boston," on the Saratoga and Schenectady Railroad.†

The report of the explosion of the locomotive engine "Boston's" boiler having reached the Schenectady Locomotive Works, Monday, 11th inst., at 2½ o'clock, P. M., Messrs. E. S. Norris, A. Thompson, E. Caldwell, and myself, set out for an examination of the engine.

Proceeding to the spot where the explosion had taken place, we found the engine upset on the foot of the embankment, the dome turned towards the track. The waist or cylindrical part of the boiler was found to be completely blown out, whilst the whole fire-box, dome, and furnace, to all appearances, have received no injury whatever. The frames, braces,

* This latter explanation has already been arrived at by Prof. Challis, by the more rigid establishment and solution of the differential equations of vibratory motion. See *Lond. Edin. and Dub. Phil. Mag.*, Vol. xxxiv. p. 353.

M. Cauchy then proceeds, in the remainder of this and in a subsequent communication, to develop the mathematical analysis upon which these curious analogies are formed. The nature of the discussion prevents us from following him in this part of his labors, but we extract from the second article (21st January) the following paragraph, developing the meaning of that which we have just quoted:

"Consequently, in order to explain this rotatory power of certain singly-refracting media, it is not necessary to have recourse to certain hypotheses imagined by different authors or by myself, nor to introduce into molecular mechanics forces which are polarized: that is, which are variable according to the directions in which they act, nor ternary actions. It is sufficient to admit that an atom of ether being brought into the presence of an atom of a body, these two atoms exercise upon each other an action which is proportional to their masses, and to a function of their distance, and to join to this hypothesis of a binary action between the atoms of the ether and of the body, the supposition of a special arrangement of these latter atoms. Among the conditions which this arrangement must satisfy, is that which physical philosophers and mineralogists admit, and the beautiful experiments of M. Pasteur demonstrate, that the crystalline form of a given singly-refracting body, cannot be superposed upon its image seen in a mirror."

Ed.

† From the American Railroad Journal, March 30, 1850.

connecting-rods, in short, all the parts connecting the front part with the back part of the engine, are torn asunder, and all the tubes, as well as the steam-pipe, are torn out of the front tube-sheet, which, under the violent strain, assumed a concave shape, and was partly rent from the waist of the boiler to which it had been riveted. The first sheet, next to the throat of the fire-box, is ripped open and bent back, so as to enter the furnace from below the grate-bars; the upper part has been completely torn from the seam, leaving a small band forming the lap behind. Thirteen copper tubes have been turned over near the furnace flue-sheet, to which they are still fast, in such a manner that they cover the left side of the fire-box.

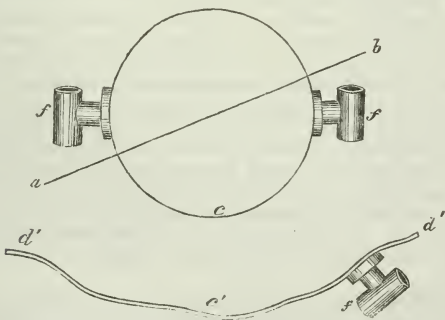
All these facts show that the seat of the explosion was in the waist of the boiler. An examination of the fragments conclusively proved this to be the case. The part of the waist to which the check-valves are attached is severed in two halves. One of these, with the left hand check and a boiler-brace still fast to it, was found about 10 yards back of the engine, at a small distance from, and on the left side of, the track; the other was thrown to the right side, and fell down a precipice forming the bank of the river on that spot.

An examination of the first fragment elicited the following facts:

1st, The rupture had taken place in a line *ab* passing nearly through the centre of the boiler, and being slightly inclined to the horizontal line.

2d, The line of rupture was irregular, partly following the seams of the boiler, and partly ripping the boiler plate.

3d, The fragment *C*, which was the one nearest to the embankment, had assumed the shape represented in the diagram at *C'*.



4th, Both extremities of that sheet, *d d'*, show distinctly the dull bluish-gray color of iron having been nearly red-hot, the inside being quite free from sediment.

5th, The brass check *f* still fastened to the end *d*, by its color, presents the appearance of polished brass after exposure to a temperature of fluid lead, or, as it is called, a black heat.

6th, The ends of the stud-bolts, by which the check is fastened to the boiler, show on the inside the appearance of having been exposed to nearly a red heat, the sediment with which such bolts are invariably found to be

covered has partly peeled off, and shows the gray color of iron which has been heated.

The above facts irresistably lead to the conclusion that the water, at the time of the explosion, was below the centre of the boiler, (which exactly coincides with the centre of the checks,) in consequence of which, the parts situated above the centre must have been overheated. The injection of the first jet of cold water, under such circumstances, must have caused instantaneous explosion, so quick indeed, that the explosive effect could only act on the vicinity of the checks, which clearly accounts for the fire-box not having been injured at all.

Mr. Blackburn, superintendent of motive power on the Utica and Schenectady Railroad, who arrived at the spot shortly after ourselves, and also undertook a very careful examination, was led to the same conclusion. Indeed, the nature of the evidence furnished by the inspection of that one fragment, was such that it could hardly fail to bring conviction, as to the cause of the accident, to the mind of any intelligent and reflecting observer.

The dusk of the evening not permitting a more minute examination of the furnace, I returned the following morning to the spot. By this time the fragments spoken of above had been removed from the premises. The other piece, with the opposite check-valve attached to it, still occupied its position on the bank of the river, and showed, as I am informed by Mr. Blackburn and others, who had examined it, less indication of heat than the one examined previously, inasmuch as only one bolt presented a blue color without sediment, the other bolts still being enveloped in sediment. The check presented also a paler color.

I then proceeded to examine the furnace flue-sheet, which, along the upper rows of tubes presented the gray appearances of heated iron, the sediment having to a great extent peeled off, bringing the clean surface of the iron into view. The upper tubes, especially those that had been turned over, showed an appearance strikingly different from the lower ones, inasmuch as they were entirely free from mud and sediment, and exhibited a perfectly clean surface. Mr. Blackburn remarks particularly, that the parts of the tubes that were found lying on the snow, or appeared to have come in contact with moisture, presented the appearance of copper heated till nearly red, and then being plunged in water. Mr. Case, who has been engaged for years in making and repairing tubes, pronounced the upper tubes of this boiler to have been overheated, though not enough to anneal the metal.

As an additional fact, going far to prove the overheated state of the boiler at the time of the explosion, it may be mentioned in this place, that fragments of the casing—easily identified as such—have come to hand, which were almost completely turned to charcoal. Now it is a well known fact, that the jacket of a locomotive boiler, under ordinary circumstances, will be slightly charred on the inside, so as to assume a dark brown color. In the present instance, the outside of the wood showed the appearance which might have been expected on the inside, whilst the inside was completely black and partly burnt off.

I shall content myself with having given, in the above, a truthful record of circumstances as they came to my cognizance, mostly through my own

observations, and partly by comparing notes with other reliable observers, especially Mr. Blackburn, to whom great credit is due for his most careful, diligent, and unprejudiced investigation of the circumstances attending the lamentable catastrophe, and I shall only add that, in considering all facts enumerated above, I can only come to the conclusion that the primary cause of the accident was a want of water in the boiler.

H. BACMEISTER.

Schenectady, March 13, 1850.

I concur in the above statements in every particular, and also pronounce it as my opinion, that the throwing of cold water on the heated surfaces of the metal, which heat was produced by a low state of the water, was the cause of the explosion.

VINCENT BLACKBURN.

It is my opinion, as above stated, that the upper tubes of the boiler of engine "Boston" were over-heated, though not enough to anneal the metal.

LEVY CASE.

I fully concur in the statement of Mr. Bacmeister, and his opinions.

ALFRED THOMPSON.

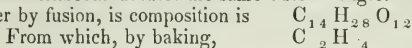
We the undersigned, having seen and examined the wreck of the engine "Boston," do agree with Mr. Bacmeister's statement, and fully concur in his opinions.

E. CALDWELL,
THOMAS CONLON,
MAXWELL COX.

Translated for the Journal of the Franklin Institute.

On a New Sugar Homologous with Grape Sugar. By M. AUG. LAURENT.

This substance, which the author proposes to call "*Dulcose*," comes from Madagascar. Its origin is not well known. It crystallizes in oblique rhombic prisms, has a slight sugary taste, and when thrown upon incandescent charcoal diffuses the same odor as sugar. When deprived of its water by fusion, its composition is



From which, by baking,

We shall have $C_{12} H_{24} O_{12}$ Grape Sugar.

When re-dissolved in water, it absorbs 3 atoms.

Like grape sugar, it plays the part of a feeble and polybasic acid, giving, with baryta, a well crystallized salt, $C_{14} H_{24} Ba_4 O_{12} + 14 Aq.$ (By the exchange of 4 H for 4 Ba.)

By nitric acid it is transformed, like milk sugar, into mucic acid. According to Biot, it exercises no influence on polarized light; and according to Soubeiran, does not undergo the alcoholic fermentation.—*Comptes Rendus de l'Academie des Sciences, de Paris, tom. xxx p. 41.*

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, March 21st, 1850.

Samuel V. Merrick, President, in the chair.

Thomas Fletcher, Vice President.

Solomon W. Roberts, Corresponding Secretary.

Isaac B. Garrigues, Recording Secretary.

John F. Frazer, Treasurer.

The minutes of the last meeting were read and approved.

A letter was read from Prof. A. D. Bache, accompanying a donation of Maps of the Coast Survey.

Donations were received from Prof. A. D. Bache, Washington City, D. C.; Hon. Jos. R. Chandler, U. S. Congress; Prof. E. Horsford, Cambridge, Mass.; John McRae, Esq., Charleston, S. C.; T. H. Forsyth, Esq., and W. H. Souder, Esq., Pennsylvania Legislature; E. M. Stanton, Esq., Major Hartman Bache, Prof. John C. Cresson, Solomon W. Roberts, Esq., R. A. Tilghman, Esq., Robert Dyball, Esq., Prof. J. C. Booth, and I. W. P. Lewis, Esq., Philadelphia.

The periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement of receipts and payments for the month of February.

The Board of Managers and the Standing Committees reported their minutes.

The following Standing Committees reported their organization, by appointing their Chairmen, and fixing the time for holding their stated monthly meetings:

<i>Committee on Meetings,</i>	Geo. W. Smith, Chair'n,	2d Monday Evening.
" <i>Library,</i>	W. S. Levering,	" 2d Tuesday "
" <i>Exhibitions,</i>	John Agnew,	" 2d Friday "
" <i>Meteorology,</i>	John Simmons,	" 2d Friday "

The Board of Managers reported that they had elected Mr. Samuel Hufty Chairman, and fixed the 3d Wednesday evening of each month for holding their stated meetings.

Mr. Wm. D. Parrish read a Memorial to the Senate and House of Representatives, together with the draft of a law, on the subject of Stationary Steam Engines and Boilers, prepared by the Committee on Science and the Arts.

On motion, the Officers of the Institute were instructed to sign the memorial, and forward it, with the draft of the law, to the Legislature.

On motion of Solomon W. Roberts, it was

Resolved, That the President of the Franklin Institute be requested to address a letter to the Secretary of the Executive Committee of "The Great Exhibition of Industry of All Nations," intended to be held in London in 1851, requesting him to transmit to the Institute any circulars or other information in his power to send, in relation to the time when the Exhibition will be opened, and the regulations under which it will be held.

A letter was read from W. Parker Foulke, Esq., declining his appointment on the Committee on the Cabinet of Minerals and Geological Specimens, which was accepted, and Richard A. Tilghman, Esq., was appointed to fill the vacancy.

New candidates for membership in the Institute (3) were proposed, and those proposed at the last meeting (6) were elected members of the Institute.

Mr. G. W. Smith, the Chairman of the Committee, introduced the subject of Melsen's Improvement in the Manufacture of Sugar, when he exhibited the specimen of sugar which was omitted on the meeting of February.

Dr. Turnbull then read a short paper upon this subject, and exhibited the result of some experiments with the bisulphite.

Mr. R. S. R. Andrews exhibited specimens of Artificial Ice, which excited considerable interest on the part of those present by its novelty. Mr. A. intends opening a skating saloon during the coming summer.

Mr. Smith, at the request of several members of the Institute, made and exhibited the Phantoscope of Prof. Locke, of Cincinnati; by means of which some very curious optical phenomena can be easily exhibited, and many of the laws of binocular vision illustrated. Those who are acquainted with the Stereoscope of Prof. Wheatstone, will perceive that the Phantoscope is but a simple and ingenious modification of that beautiful instrument, which was also exhibited by Mr. Smith.

A new and improved Railroad Chair was brought before the meeting, and its principle explained by Prof. Cresson. It is the invention of Mr. Thomas S. Speakman, and was referred to the Committee on Science and the Arts.

Mr. Rodgers exhibited specimens of beautiful new Stoneware, resembling porcelain, from Bennington, Vermont, composed of white quartz from the White Mountains, and flint from the Green Mountains, of great hardness and durability.

Prof. J. F. Frazer exhibited specimens of Limestone and Coal from California, sent for analysis. Some discussion arose as to the nature of the Coal, its composition being as follows:

Color, black; Lustre, resinous; Fracture, conchoidal; Splits into rhomboidal pieces; Streak, brownish-black; Sparkling; Specific Gravity, 1.314; Cokes very easily, and is very dry; Ash, brownish-red, with very little grit.

ANALYSIS:—

Loss at 212° (water, &c.)	4.9
“ red-heat (bitumen, &c.)	49.5
“ by burning (free carbon)	42.9
Remainder (ashes)	2.7

No trace of sulphur.

100.0

From microscopic examination and test. It appears to be not a true coal, but a lignite. The composition of the Limestone was as follows:

Color, drab; Earthy appearance, with frequent sparry veins; Specific Gravity, 2.63.

Silica,	0.30
Ox. Iron and Alumina,	1.40
Carbonate of Lime,	97.80
Carbonate of Magnesia,	trace.
Water,	0.25

99.75

At the request of the Chairman, Mr. Solomon W. Roberts made some remarks upon Bridges. He referred to the importance of economy in their construction, as large sums were often expended in such structures, when a less amount would answer the purpose. Suspension bridges supported

by iron chains or wire cables, subjected to a tensile strain, are comparatively cheap. When the material used is wrought iron it is easy to make strong splices, but this is not the case with wood. Suspension bridges on a large scale cannot readily be built of wood, on account of the difficulty of tying the timbers securely together and holding them fast. The bridges built by a person named Remington, about which a good deal was said in the newspapers not long ago, were wooden suspension bridges on a small scale. It is believed that the first rude suspension bridges ever made were constructed of grape vines or some similar materials of vegetable growth. They were, of course, but of small dimensions.

The railroads of our country abound in examples of economical bridge-building; and when we are informed that more than three millions of dollars have recently been expended in England, in building a railroad bridge about fifteen hundred feet long and one hundred feet high, it seems almost incredible. No doubt the difficulties were great, and no doubt the bridge in question is a magnificent structure; but a person accustomed to the exigencies of engineering in America shrinks from the idea of such an outlay of capital.

The wagon bridge across the Niagara river, below the Falls, is a cheap structure, the span being about seven hundred and fifty feet, and the height more than two hundred feet. It is understood that, at the same point, two able, experienced, and responsible engineers have offered to contract to build a substantial bridge for railroad trains, across the most terrific torrent on the globe; and that the price asked by one was two hundred thousand dollars, and the other one hundred and ninety thousand dollars. At such prices, the bridge would cost but little, if any, more than the interest for one year, at six per cent., of the cost of the tubular bridge across the Menai Strait. The cases were not alike, but they might serve to draw attention to the different circumstances under which engineering works are executed in England and America.

BIBLIOGRAPHICAL NOTICE.

Specimens of the Stone, Iron, and Wood Bridges, Viaducts, Tunnels, Culverts, &c., of the United States Railroads, illustrated by a series of Drawings from actual measurement of the works, &c. By GEORGE DUGGAN, Architect and Civil Engineer. New York, 1850.

We have received several numbers of this new work, which is in folio, and is issued once a month, at the price of 75 cents per number. Each number contains several plans of important bridges, engraved in a clear and handsome style. Specifications, bills of timber, and other particulars, accompany the plans, and the information given is of a highly practical and useful character. The work is executed in a very creditable style, and we commend it to the patronage of Civil Engineers and others interested in internal improvements. We would call attention particularly to the great bridge of timber, having a single span of 275 feet, across the valley of Cascade Creek, in Pennsylvania, upon the line of the New York and Erie Railroad, built under the direction of Major T. S. Brown, Chief Engineer of that road.

JOURNAL
OF
THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA
FOR THE
PROMOTION OF THE MECHANIC ARTS.

MAY, 1850.

CIVIL ENGINEERING.

*Report of the Commissioners Appointed to Inquire into the Application of
Iron to Railway Structures.**

From the information supplied to us, it appears that the proportions and forms at present employed for iron structures, have been generally derived from numerous and careful experiments, made by subjecting bars of wrought or cast iron, of different forms, to the action of weights, and thence determining by theory and calculation such principles and rules as would enable these results to be extended and applied to such larger structures and loads as are required in practice. But the experiments were made by dead pressure, and only apply therefore to the action of weights at rest. On the contrary, from the nature of the railway system, the structures employed therein are necessarily exposed to concussions, vibrations, torsions, and momentary pressures of enormous magnitude, produced by the rapid and repeated passage of heavy trains.

These disturbing causes, in smaller degree, have always occurred in structures connected with mill-work or other mechanism. But the effects upon their stability have not been found greater than could be met by increasing the dimensions of the parts without especially inquiring into the exact principles upon which such increase should be made. Thus, we are informed that the dimensions of cast iron girders, intended for sustaining stationary loads, such as water-tanks and floors, are usually so proportioned that their breaking-weight shall be three times as great as the load they are expected to carry, or in some cases four or five times as great. But when the girders are intended for railway bridges, and therefore sub-

* From the London Civil Engineer and Architect's Journal, for February, 1850.

ject to much concussion and vibration, greater strength is given to them by altering the above proportions, and making the breaking-weight from six to ten times as great as the load, according to the practice of different engineers. On the other hand, some consider that one-third of the breaking-weight is as safe a load in the latter case as in the former.

As it soon appeared, in the course of our inquiry, that the effects of heavy bodies moving with great velocity upon structures had never been made the subject of direct scientific investigation, and as it also appeared that, in the opinion of practical and scientific engineers, such an inquiry was highly desirable, our attention was early directed to the devising of experiments for the purpose of elucidating this matter.

The questions to be examined may be arranged under two heads, namely—

1. Whether the substance of metal which has been exposed for a long period to percussions and vibrations, undergoes any change in the arrangement of its particles, by which it becomes weakened?

2. What are the mechanical effects of percussions, and of the passage of heavy bodies, in deflecting and fracturing the bars and beams upon which they are made to act?

A great difference of opinion exists among practical men with respect to the first of these questions. Many curious facts have been elicited by us in evidence, which show that pieces of wrought iron which have been exposed to vibration, such as the axles of railway carriages, the chains of cranes, &c., employed in raising heavy weights, frequently break after long use, and exhibit a peculiar crystalline fracture and loss of tenacity, which is considered by some engineers to be the result of a gradual change produced in the internal structure of the metal by the vibrations. In confirmation of this, various facts are adduced, as, for instance, that if a piece of good fibrous iron have the thread of a screw cut upon one end of it by the usual process of tapping, which is always accompanied by much vibratory action, and if the bar be then broken across, it will be found that the tapped part is a good deal more crystalline than the other portion of the bar. Others contend that this peculiar structure is the result of an original fault in the process of manufacture, and deny this effect of vibration altogether, whilst some allege that the crystalline structure can be imparted to fibrous iron in various ways, as by repeatedly heating a bar red-hot, and plunging it into cold water, or by continually hammering it, when cold, for half an hour or more.

Mr. Brunel, however, thinks the various appearances of the fracture depend much upon the mode in which the iron is broken. The same piece of iron may be made to exhibit a fibrous fracture when broken by a slow heavy blow, and a crystalline fracture when broken by a sharp short blow. Temperature alone has also a decided effect upon the fracture; iron broken in a cold state shows a more crystalline fracture than the same iron warmed a little.

The same effects are by some supposed to be extended to cast iron.

We have endeavored to examine this question experimentally in various ways.

A bar of cast iron, 3 inches square, was placed on supports about 14 feet asunder. A heavy ball was suspended by a wire 18 feet long, from

the roof, so as to touch the centre of the side of the bar. By drawing this ball out of the vertical position at right angles to the length of the bar, in the manner of a pendulum, to any required distance, and suddenly releasing it, it could be made to strike a horizontal blow upon the bar, the magnitude of which could be adjusted at pleasure, either by varying the size of the ball or the distance from which it was released. Various bars (some of smaller size than the above) were subjected by means of this apparatus to successions of blows, numbering in most cases as many as 4000, the magnitude of the blow in each set of experiments being made greater or smaller as occasion required. The general result obtained was, that when the blow was powerful enough to bend the bars through one-half of their ultimate deflexion, (that is to say, the deflexion which corresponds to their fracture by dead pressure,) no bar was able to stand 4000 of such blows in succession; but all the bars, when sound, resisted the effects of 4000 blows, each bending them through one-third of their ultimate deflexion.

Other cast iron bars, of similar dimensions, were subjected to the action of a revolving cam, driven by a steam engine. By this they were quietly depressed in the centre, and allowed to restore themselves, the process being continued to the extent even, in some cases, of 100,000 successive periodic depressions for each bar, and at a rate of about four per minute. Another contrivance was tried, by which the whole bar was also, during the depression, thrown into a violent tremor. The results of these experiments were, that when the depression was equal to one-third of the ultimate deflexion, the bars were not weakened. This was ascertained by breaking them in the usual manner with stationary loads in the centre. When, however, the depressions produced by the machine were made equal to one-half of the ultimate deflexion, the bars were actually broken by less than 900 depressions. This result corresponds with and confirms the former.

By other machinery, a weight equal to one-half of the breaking-weight was slowly and continually dragged backwards and forwards from one end to the other of a bar of similar dimensions to the above. A sound bar was not apparently weakened by 96,000 transits of the weight.

It may, on the whole, therefore be said that, as far as the effects of reiterated flexure are concerned, cast iron beams should be so proportioned as scarcely to suffer a deflexion of one-third of their ultimate deflexion. And as it will presently appear that the deflexion produced by a given load, if laid on the beam at rest, is liable to be considerably increased by the effect of percussion, as well as by motion imparted to the load, it follows, that to allow the greatest load to be one-sixth of the breaking-weight is hardly a sufficient limit for safety, even upon the supposition that the beam is perfectly sound.

In wrought iron bars no very perceptible effect was produced by 10,000 successive deflexions by means of a revolving cam, each deflexion being due to half the weight which, when applied statically, produced a large permanent flexure.

Under the second head, namely, the inquiry into the mechanical effects of percussions and moving weights, a great number of experiments have been made to illustrate the impact of heavy bodies on beams. From these it appears that bars of cast iron of the same length and weight, struck hori-

zontally by the same ball, (by means of the apparatus above described for long continued impact,) offer the same resistance to impact whatever be the form of their transverse section, provided the sectional area be the same. Thus a bar, $6 \times 1\frac{1}{2}$ inches in section, placed on supports about 14 feet asunder, required the same magnitude of blow to break it in the middle, whether it was struck on the broad side or the narrow one, and similar blows were required to break a bar of the same length, the section of which was a square of 3 inches, and therefore of the same sectional area and weight as the first.

Another course of experiments tried with the same apparatus showed, amongst other results, that the deflexions of wrought iron bars produced by the striking ball were nearly as the velocity of impact. The deflexions in cast iron are greater than in proportion to the velocity.

A set of experiments was undertaken to obtain the effects of additional loads spread uniformly over a beam, in increasing its power of bearing impacts from the same ball falling perpendicularly upon it. It was found that beams of cast iron, loaded to a certain degree with weights spread over their whole length, and so attached to them as not to prevent the flexure of the bar, resisted greater impacts from the same body falling on them than when the beams were unloaded, in the ratio of two to one. The bars in this case were struck in the middle by the same ball falling vertically, through different heights, and the deflexions were nearly as the velocity of impact.

We have also carried on a series of experiments to compare the mechanical effect produced by weights passing with more or less velocity over bridges, with their effect when placed at rest upon them. For this purpose, amongst other methods, an apparatus was constructed, by means of which a car, loaded at pleasure with various weights, was allowed to run down an inclined plane; the iron bars which were the subject of the experiment were fixed horizontally at the bottom of the plane, in such a manner that the loaded car would pass over them with the velocity acquired in its descent. Thus the effects of giving different velocities to the loaded car, in depressing or fracturing the bars, could be observed and compared with the effects of the same loads placed at rest upon the bar.

This apparatus was on a sufficiently large scale to give a practical value to the results; the upper end of the inclined plane was nearly 40 feet above the horizontal portion, and a pair of rails, 3 feet asunder, were laid along its whole length for the guidance of the car, which was capable of being loaded to about 2 tons; the trial bars, 9 feet in length, were laid in continuation of this railway at the horizontal part, and the inclined and horizontal portions of the railway were connected by a gentle curve. Contrivances were adapted to the trial bars, by means of which the deflexions produced by the passage of the loaded car were registered; the velocity given to the car was also measured, but that velocity was, of course, limited by the height of the plane, and the greatest that could be obtained was 43 feet per second, or about 30 miles per hour.

A great number of experiments were tried with this apparatus, for the purpose of comparing the effects of different loads and velocities upon bars of various dimensions, and the general result obtained was, that the deflexion produced by a load passing along the bar was greater than that

which was produced by placing the same load at rest upon the middle of the bar, and that this deflexion was increased when the velocity was increased. Thus, for example, when the carriage, loaded to 1120 lbs., was placed at rest upon a pair of cast iron bars, 9 feet long, 4 inches broad, and $1\frac{1}{2}$ inches deep, it produced a deflexion of $\frac{6}{10}$ ths of an inch; but when the carriage was caused to pass over the bars at the rate of 10 miles an hour, the deflexion was increased to $\frac{8}{10}$ ths, and went on increasing as the velocity was increased, so that at 30 miles per hour, the deflexion became $1\frac{1}{2}$ in.; that is, more than double the statical deflexion.

Since the velocity so greatly increases the effect of a given load in deflecting the bars, it follows that a much less load will break the bar when it passes over it than when it is placed at rest upon it, and, accordingly, in the example above selected, a weight of 4150 lbs. is required to break the bars if applied at rest upon their centres; but a weight of 1778 lbs. is sufficient to produce fracture if passed over them at the rate of 30 miles an hour.

It also appeared that, when motion was given to the load, the points of greatest deflexion, and, still more, of the greatest strains, did not remain in the centre of the bars, but were removed nearer to the remote extremity of the bar. The bars, when broken by a traveling load, were always fractured at points beyond their centres, and often broken into four or five pieces, thus indicating the great and unusual strains they had been subjected to.

We have endeavored to discover the laws which connect these results with each other and with practice, and for this purpose a smaller and more delicate apparatus was constructed to examine the phenomena in their simplest form—namely, in the case of a single weight traversing a light elastic bar. For the weight in its passage along the bar deflects it, and thus the path or trajectory of the centre of the weight, instead of being a horizontal straight line, as it would be if the bar were perfectly rigid, becomes a curve, the form of which depends upon the relation between the length, elasticity, and inertia of the bar, the magnitude of the weight, and the velocity imparted to it. If the form of this curve could be perfectly determined in all cases, the effects of traveling loads upon bars would be known; but, unfortunately, the problem in question is so intricate that its complete mathematical solution appears to be beyond the present powers of analysis, except in the simplest and most elementary case—namely, in which the load is so arranged as to press upon the bar with one point of contact only, or, in other words, the load is considered as a heavy moving point. In practice, on the contrary, a single four-wheeled carriage touches each rail or girder in two points, and a six-wheeled engine, with its tender, has five or six points in contact on each side. This greatly complicates the problem.

The above smaller apparatus is so arranged as to comply with the simplest condition that the load shall press upon one point only of the bar, and is also furnished with a contrivance by which the effects of various proportions of the mass of the bar to that of the load can be examined. From the nature of the problem, it is convenient to consider, in the first place, the forms of the trajectories that are described, and the corresponding de-

flexions of the bar, when the mass of the bar is exceedingly small compared with that of the load.

Having obtained these under different relations of the length of the bridge, its statical deflexion, and the velocity of the passing load, we proceed to investigate, in addition, the effect which a greater proportional mass of the bar or bridge has upon the deflexions. We have been greatly assisted in this research by a most elaborate and complete analytical investigation by George Stokes, Esq., Fellow of Pembroke College, Cambridge, undertaken at the request of one of the members of the Commission. Unfortunately, the extreme difficulty of the problem has rendered its solution unattainable excepting in the cases in which the mass of the bridge is supposed to be exceedingly small compared with that of the load, and in the opposite case in which the mass of the load is supposed to be small compared with that of the bridge. The examples that occur in practice lie between these two extremes; for in the experiments of the Commission, performed at Portsmouth, with the inclined plane already described, the weight of the load was from three to ten times that of the bar; but this is a much greater proportion than that which occurs in bridges, partly on account of the necessity for employing in experiments very flexible bars, to render the changes of deflexion sufficiently apparent, and partly on account of the great difference of length; for if bars bearing the same ratio of weight to that of the load were employed in experiment, the deflexion would become so small as to be scarcely appreciable. This will readily be perceived when it is stated that, in a bridge of 33 feet long, a deflexion not greater than one-fourth of an inch is usually allowed, which deflexion is only $\frac{1}{1440}$ th part of its length; whereas, in experiment, it is necessary to employ deflexions of two or more inches. In actual bridges of about 40 feet span, the weight of the engine and tender is very nearly the same as the weight of that half of the bridge over which it passes; and in large bridges the weight of the load is much less than that of the bridge.

Mr. Stokes has shown that, when the inertia of the bridge is supposed small, the trajectories of the load and the corresponding deflexion of the bridge depend upon a certain quantity, which he terms β ; this quantity varies directly as the square of the length of the bar, and inversely as the product of the central statical deflexion, (namely, that which would be produced by the load set at rest on the centre of the bridge,) and of the square of the velocity with which the load passes over the bridge. When β is small, the increase of deflexion due to the velocity of the load becomes very great, so much so that if β be equal to 1·3, the statical deflexions are doubled, and are tripled when $\beta = 0\cdot8$; becoming still greater as lesser values of β are taken. On the contrary, greater values of β correspond to small deflexions; and it has been shown by our researches that, in the cases of real bridges, β is rarely less than 14, and is commonly very much greater; and that, consequently, the greatest increase of deflexion from velocity would be, upon this theory, never greater than one-tenth, varying from that to one-hundredth, or less. As β varies directly as the square of the length of the bridge, it is plain that the nine-feet bars of the Portsmouth experiments will correspond to much less values of β than the 20 and 30-foot lengths of actual bridges; while the values of β in the former cases are still further diminished by the greater deflexions necessarily

employed in experiments, as above explained. It is thus shown that the enormous increase of deflexion produced by velocity in the Portsmouth experiments cannot occur with real bridges, since it appears that the phenomena in question are developed to a great extent when the magnitude of the structure is diminished. But these calculations are made upon the supposition that the inertia of the bridge is very small; and experiments made with the small apparatus above mentioned have shown that, while ρ is less than about unity, the inertia of the bridge tends to diminish the deflexion; while, on the other hand, when ρ is greater than unity, (including, of course, all practical cases,) the inertia of the bridge tends to increase the deflexions, obtained upon the above supposition. Lastly, the total increase of the statical deflexion, when the inertia of the bridge is taken into account, will be found much greater for short bridges than for long bridges. Supposing, for example, the mass of the traveling load and of the bridge to be nearly equal, the increase of the statical deflexion at the highest velocities, for bridges of 20 feet in length, and of the ordinary degree of stiffness, may be more than one-half; whereas, for bridges of 50 feet in length, the increase will not be greater than one-seventh, and will rapidly diminish as greater lengths are taken. But as it has been shown that the increase *cæteris paribus* is diminished by increasing the stiffness of the bridge, we always have it in our power to reduce its amount within safe limits. Hence in estimating the strength of a railway bridge, this increase of the statical deflexion must be taken into account, by calculating it from the greatest load which is likely to pass over the bridge, and from the highest possible velocity. It must be remembered, also, that this deflexion is liable to be increased by jerks produced by the passage of the train over the joints of the rails.

We also made some experiments by means of the large apparatus before mentioned, on curved bars, and these bore much greater weights at high velocities than straight bars; but the deflexions of these bars were very great compared with their length. In drawing attention to these experiments, we would remark that, in actual structures, where the deflexions are so very small, the effect of cambering the girders, or of forming a curved pathway for the load, would be of less comparative importance, and might tend to introduce practical inconvenience.

The general impression among engineers appears to be at variance with the above results. They, for the most part, state their belief that the deflexion caused by passing a weight at a high velocity over a girder, is less than the deflexion which would be produced by the same weight at rest; even when they have observed an increase, they have attributed it solely to the jerks of the engine or train, produced by passing over inequalities at the junction of the rails, or other similar causes.

For the purpose of examining this question, we have submitted two actual bridges to the test of experiment. These bridges, one of which, the Ewell Bridge, is situated upon the Croydon and Epsom line, and the other, the Godstone Bridge, upon the South Eastern line, are both constructed to carry the railway over a road. A scaffold was constructed, which rested on the road, and was, therefore, unaffected by the motion of the bridge, and a pencil was fixed to the under side of one of the girders of the bridge, so that when the latter was deflected by the weight of the engine or train,

either placed at rest or passing over it, the pencil traced the extent of deflexion upon a drawing board attached to the scaffold. An engine and tender, which had been in each case liberally placed under our orders by the directors of the companies, was made to traverse the bridges at different velocities, or rest upon them at pleasure. The span of the Ewell Bridge is 48 feet, and the statical deflexion due to the above load rather more than one-fifth of an inch. This was slightly but decidedly increased when the engine was made to pass over the bridge, and at a velocity of about 50 miles per hour, an increase of one-seventh was observed. As it is known that the strain upon a girder is nearly proportional to the deflexion, it must be inferred that, in this case, the velocity of the load enabled it to exercise the same pressure as if it had been increased by one-seventh, and placed at rest upon the centre of the bridge. The weight of the engine and tender was 39 tons, and the velocity enabled it to exercise a pressure upon the girder equal to a weight of about 45 tons. Similar results were obtained from the Godstone Bridge. We would take this opportunity of mentioning how much we are indebted to Mr. P. W. Barlow, and to Mr. Hood, for the assistance they afforded us in making these experiments.

We have also to express our obligations to the Astronomer Royal, for the advantage of his presence during the above and other experiments, as well as for many valuable suggestions during the progress of the inquiry.

In addition to the above experiments, we have made many for the purpose of supplying data for completing the mechanical theory of elastic beams. If a beam be in any manner bent, its concave side will be compressed, and its convex side extended. An exact knowledge of the laws which govern its compression and extension must precede any accurate general theory of its deflexions, vibrations, and ruptures.

The law which is usually assumed in mathematical investigations, and by which the longitudinal compressions and extensions, within certain limits, are assumed to be directly proportional to the forces by which they are produced, although very nearly true in some bodies, is not, perhaps, accurately true for any material.

Experiments have, therefore, been made to determine with precision the direct longitudinal extension and compression of long bars of cast and wrought iron. The extensions were determined by attaching a bar, 50 feet in length and 1 inch square, to the roof of a lofty building, and suspending weights to its lower extremity.

The compressions were ascertained by enclosing a bar, 10 feet long and 1 inch square, in a groove placed in a cast iron frame, which allowed the bar to slide freely without friction, and yet permitted no lateral flexure. The bar was then compressed by means of a lever loaded with various weights. Every possible precaution was taken to ensure accuracy. The following formulæ were deduced for expressing the relation between the extension and compression of a bar of cast iron, 10 feet long and 1 inch square, and the weights producing them respectively:—

$$\begin{aligned}\text{Extension, } w &= 116117e - 201905e^2 \\ \text{Compression, } w &= 107763d - 36318d^2.\end{aligned}$$

Where w is the weight in pounds acting upon the bar, e the extension, and d the compression in inches.

And the formulæ deduced from these for a bar 1 inch square, and of any length, are—

$$\text{For Extension,} \quad w = 13934040 \frac{e}{l} - 2907432000 \frac{e^2}{l^2}.$$

$$\text{For Compression,} \quad w = 12931560 \frac{d}{l} - 522979200 \frac{d^2}{l^2}.$$

Where l is the length of the bar in inches.

These formulæ were obtained from the mean results of four kinds of cast iron.

The mean tensile strength of cast iron derived from these experiments is 15,711 lbs. per square inch, and the ultimate extension $\frac{1}{60}$ of the length, and this weight would compress a bar of iron of the same section $\frac{1}{75}$ of its length. It must be observed that the usual law is very nearly true for wrought iron.

Many denominations of cast iron have got into common use, of which the properties had not yet been ascertained with due precision. Seventeen kinds of them have been selected, and their tensile and crushing forces determined. Experiments have also been made upon the transverse strength and resistance of bars of wrought and cast iron acted upon by horizontal as well as vertical forces. These experiments will be found to exhibit very fully the deflexions and sets of cast iron, and the defect of its elasticity.

The bars which were experimented upon by transverse pressure, were of sections varying from 1 inch square to 3 inches square, and of various other sections, and the actual breaking weights show that the strength of a bar 1 inch square should not be taken as the unit for calculating the strength of a larger casting of similar metal, although the practice of doing so has been a prevalent one, for it appears that the crystals in the portion of the bar which cools first are small and close, whilst the central portion of bars 2 inches square, and 3 inches square, is composed of comparatively large crystals, and bars of 3 inches square in section, planed down on all sides alike to $\frac{3}{4}$ of an inch square, are found to be very weak to resist both transverse and crushing pressure. Hence it appears desirable, in seeking for a unit for the strength of iron of which a large casting is to be made, that the bar used should equal in thickness the thickest part of the proposed casting.

The performance of these various experiments has been greatly facilitated by the permission which was liberally granted to us by the Lords Commissioners of the Admiralty, to make use of Portsmouth Dockyard in carrying on our investigations, in addition to which, however, we found it necessary to hire for several months some premises in Lambeth. This was found requisite for the performance of those portions of the experimental inquiry which had been undertaken by Eaton Hodgkinson, Esq. Although we are aware that, to point out the labors of individual members of the Commission would be impossible, and that it may appear invidious to single one out for praise, we cannot resist the expression of our thanks to the above-named gentleman, for the zeal and intelligence with which he has carried out the remarkable series of experiments which are detailed in the Appendix to this Report, and which constitute a large proportion of those which have been already described.

In addition we have obtained, from many of the iron-masters, information respecting the various processes employed by them in the manufacture of their irons, and the effect of such processes upon the strength and properties of the material produced; and we have also made careful inquiries of civil engineers with respect to the qualities and mixtures of iron preferred by them, for the large castings used in the construction of railway bridges, and to the respective properties of hot-blast and cold-blast iron; this investigation has been greatly facilitated by the liberality and candor with which these gentlemen have communicated to us the results of their experience.

As no map of the kingdom had been constructed representing the districts in which iron is found and worked, we applied to the officers of the Museum of Practical Geology for their assistance, and they caused one to be prepared expressly to accompany this Report, in which the principal furnaces now in blast are shown.

Great differences of opinion exist with respect to the best qualities and mixtures of iron; and, after all, it appears that those employed for large castings depend practically so much upon the commercial question of relative cost, that engineers are rarely able to select the very best material. It is generally admitted that engineers have no guarantee that the mixture for which they have stipulated in a contract shall be that used by the founder, and no certain test by which to determine whether a given piece of iron has been manufactured by hot or cold blast. A very good protection appears to be contained in the recommendation of Mr. Fox, that engineers, in contracting for a number of girders, should stipulate that they should not break with less than a certain weight, (leaving the mixture to the founder,) and cause one more than the required number to be cast. The engineer may then select one to be broken, and if it break with less weight than that agreed upon, the whole may be rejected.

At the beginning of the railway system, the bridges were naturally constructed upon similar principles to those which had been already employed for common roads or aqueducts. Some of these ordinary constructions have proved inadequate to sustain the enormous loads and vibrations of railway trains. Some have been considered too expensive; others, as the suspension bridges, have been found wholly unfitted for railway purposes. Moreover, the necessity for preserving the level of a railroad as much as possible, combined with that of passing under or over existing canals, rivers, or roads, has created a demand for those forms of bridges which admit of being kept as low as possible, consistently with the proper headway or passage below; or, in other words, of making the least possible difference of level between the road or stream which the bridge has to carry and that which it has to cross.

From these causes, combined with the innumerable opportunities of building new bridges which the railways have given occasion to, and a constant endeavor to reduce the expense of building them, a variety of new constructions have been proposed and essayed, most of them of great merit and value, while others appear to be of very doubtful stability.

On the whole, the art of railway bridge-building cannot be said to be in that settled state which would enable an engineer to apply principles with

confidence. We have, therefore, thought it our duty to inquire into the present methods of railway bridge-building, to collect in evidence the opinions and practice of the leading members of the profession of civil engineers upon this branch of construction, and especially with respect to the form and proportions of simple cast iron girders, the practical limits to the employment of such girders, the methods of combining them with the rest of the structure, the various forms of compound girders, the expediency of several combinations of wrought iron with cast iron; and, finally, the comparative merits of plain girders, and of other forms in which the principles of the arch, or other methods of giving stiffness, are introduced.

The simplest bridge, and that which admits of the greatest possible headway at a given elevation, is, undoubtedly, the straight girder bridge.

The length of a simple cast iron girder appears to be limited only by the power of making sound castings, and the difficulty of moving large masses. Thus the practical length has been variously stated to us as 40, 50, and 60 feet. The form resulting from Mr. Hodgkinson's former experiments on this subject, is universally admitted to be that which gives the greatest strength; but the requirements of construction compel many variations from it, especially in the ratio between the top and bottom flanches. Moreover, the convenience and the necessity of keeping the roadway for rails as low as possible, has introduced a practice of supporting the beams which sustain the rails upon one side of the bottom flanch. The pressure of the roadway, and of the passing loads, being thus thrown wholly on one side of the central vertical web of the girder, produces torsion (which is not always taken into account in determining the proportions of the girder.) The existence of this torsion is admitted on all hands, and various schemes are employed to counteract and diminish it; but the form of a girder that will effectually resist this disturbing force, without incurring other evils, still remains a desideratum.

The requisite length of girders is increased considerably by the excessive use of skew bridges; and it is much to be regretted that difficulties should often be thrown in the way of altering the course of existing roads and canals when the line of a proposed railway happens to cross them at an acute angle. Partly from these causes, and partly from a little indulgence in the pride of construction, skew bridges may be found, of which, from the obliquity of the bridge, the girders are more than double the length that would be required by the direct span of the opening to be crossed.

When the span of the opening or other circumstances render the use of single straight girders unadvisable, straight girders built up of several separate castings bolted together, and sometimes trussed with wrought iron tension rods, are largely employed, and necessarily with great varieties of construction. By these means the girders may be extended to spans of upwards of 120 feet.

When wrought iron is combined with cast iron in the manner of trussing, several difficulties arise from the different expansions of the two metals, and the difference of their masses, which causes the wrought iron rods to be more rapidly affected by a sudden change of temperature than the cast iron parts. The constant strain upon the wrought iron tends to produce

a permanent elongation, and hence tension rods may require to be occasionally screwed up. We have sought for opinions and information upon all these questions, and these show that the greatest skill and caution are necessary to insure the safe employment of such combinations. It is not admitted that the vibration of railway trains would loosen or injure the bolts or rivets of compound girders. Nevertheless, wood, felt, or other similar substances, have occasionally been introduced between surfaces to diminish the communication of vibration.

The general opinion of engineers appears to be, that the cast iron arch is the best form for an iron bridge, when it can be selected without regard to expense or to the height above the river or road which is to be crossed. For low bridges, the bowstring girder is recommended. Lattice bridges appear to be of doubtful merit.

The latest mode of construction that has been introduced consists of boiler plates, riveted together as in iron ship-building, and combined in various ways with cast iron. Hollow girders are thus formed, which are either made so large as to admit of the road and carriages passing through them, as in the Conway and Britannia bridges, or else these tube girders are made on a smaller scale, and employed in the same manner as the ordinary cast iron girders, to sustain transverse joists which carry the road. The first kind is applicable to enormous spans, those of the two bridges above mentioned being 400 and 462 feet respectively. The second kind are said to be cheaper and more elastic than other forms for spans that exceed 40 feet.

These methods appear to possess and to promise many advantages, but they are of such recent introduction that no experience has yet been acquired of their powers to resist the various actions of sudden changes of temperature, vibrations, and other causes of deterioration. We have thought it our duty to seek for information with respect to them, and we find engineers to be, for the most part, exceedingly favorable towards them; but, for the reasons above stated, we are unable to express any opinion upon them. At the same time, we desire to bear testimony to the patient care and scientific manner in which the forms and proportions of the great tubes of the Conway and Britannia bridges have been elaborated; and we must beg to refer to the Minutes of Evidence for the details of the information which we have collected.

The investigation in which we have been concerned has made it evident that the novelty of the railway system has introduced a variety of new mechanical causes, the effects of which have not yet had time fully to develop themselves, on account of the extent and number of new railways, and the rapidity with which they were constructed,—in many cases scarcely giving breathing time to the engineers, by which to observe and profit by the experience of each successive new construction. Thus it has happened that some portions of mechanism and structure have been made too weak, or placed in unfavorable combinations; and hence some unavoidable, but most lamentable, and sometimes fatal, accidents have been occasioned. It also appears that there exists a great want of uniformity in practice in many most important matters relating to railway engineering, which shows how imperfect and deficient it yet is in leading principles.

But we have also observed throughout the present inquiry that the engineers have been already warned by experience of the necessity for increasing the strength of bridges employed in railways; and of watching more narrowly their construction, so as to render them as strong as possible. Accordingly we have found that the original structure of all those bridges which had shown the least signs of weakness, has been carefully altered and strengthened, so as to leave no apparent cause for apprehension; while in new bridges, better and stronger combinations are adopted.

And in conclusion, considering that the attention of engineers has been sufficiently awakened to the necessity of providing a superabundant strength in railway structures, and also considering the great importance of leaving the genius of scientific men unfettered for the development of a subject as yet so novel and so rapidly progressive as the construction of railways, we are of opinion that any legislative enactments with respect to the forms and proportions of the iron structures employed therein would be highly inexpedient.

We would, however, direct attention to the general conclusions we have arrived at from our own experiments, and from the information supplied to us, namely,—

That it appears advisable for engineers, in contracting for castings, to stipulate for iron to bear a certain weight instead of endeavoring to procure a specified mixture.

That, to calculate the strength of a particular iron for large castings; the bars used as a unit should be equal in thickness to the thickest part of the proposed casting.

That, as it has been shown that to resist the effects of reiterated flexure, iron should scarcely be allowed to suffer a deflexion equal to one-third of its ultimate deflexion, and since the deflexion produced by a given load is increased by the effects of percussion, it is advisable that the greatest load in railway bridges should, in no case, exceed one-sixth of the weight which would break the beam when laid on at rest in the centre.

That, as it has appeared that the effect of velocity communicated to a load is to increase the deflexion that it would produce if set at rest upon the bridge; also that the dynamical increase in bridges of less than 40 feet in length is of sufficient importance to demand attention, and may, even for lengths of 20 feet, become more than one-half of the statical deflexion at high velocities, but can be diminished by increasing the stiffness of the bridge; it is advisable that, for short bridges especially, the increased deflexion should be calculated from the greatest load and highest velocity to which the bridge may be liable; and that a weight which would statically produce the same deflexion should, in estimating the strength of the structure, be considered as the greatest load to which the bridge is subject.

Lastly, the power of a beam to resist impact varies with the mass of the beam, the striking body being the same, and by increasing the inertia of the beam without adding to its strength, the power to resist impact is, within certain limits, also increased. Hence it follows that weight is an important consideration in structures exposed to concussions.

Whilst, however, we lament that the limited means which have been placed at our disposal, and the great time required for such investigations, have compelled us to leave in an imperfect state, or even to neglect alto-

gether, many interesting and important branches of experimental inquiry, we trust that the facts and opinions which we have been enabled to collect will serve to illustrate the action which takes place under varying circumstances in iron railway bridges, and enable the engineer and mechanic to apply the metal with more confidence than heretofore.

WROTTESELEY.
ROBERT WILLIS.
HENRY JAMES.
GEORGE RENNIE.
W. CUBITT.
EATON HODGKINSON.

DOUGLAS GALTON, *Lieut. Royal Engineers,*
Secretary.

Whitehall, 26th July, 1849.

To be continued.

*Opening of the Victoria Suspension Bridge, at Lochabar, Scotland.**

At the dinner in celebration of the opening of the Victoria Suspension Bridge over the river Lochy, between Fort William and Corpach, built at the expense of "Lochiel," Mr. Dredge, the inventor of the peculiar system of suspension adopted for the bridge, made the following remarks:

Mr. Dredge, after thanking the company for the compliment paid him, observed that it was to Lochiel the compliment was due for his appreciation of, and confidence in, the new principle. After referring to the disadvantages of ferries, he proceeded:—"The confined limits of the stone arch for spanning broad rivers and ravines, with the difficulty of obtaining level roads over them, has kept it out of the reach of many a proprietor, who would otherwise have gladly bestowed on the public the advantages of a bridge. Therefore, in numerous instances, to their great prejudice, a great inconvenience has long been borne with. The timber bridge, it is true, is less expensive, but its durability is short, hence the rude ferry-boat is still a substitution for a bridge in various places, especially in the Highlands; but it might almost universally be dispensed with, for the principle upon which the bridge has just been erected over the Lochy affords every person who wants a bridge the opportunity of no longer putting up with inconvenience; it is so truly economical, powerful, and durable, not of the costly stone material, nor of timber, which is calculated to last but thirty years, is it built, but of iron, the durability of which we cannot compute, as iron bridges are of modern date.

"A stone bridge at Lochy Ferry was estimated to cost £8000, which sum, I believe, was the lowest tender. But it was to be composed of many arches, and as many piers in the river, obstructing its impetuous current, and probably damaging the valuable salmon fishings. The object is now attained with a level iron bridge, at a cost of less than £2000, without the least obstruction to the current, whereby the liability of ever being overturned by flood or storm is avoided, and, consequently, its *first* will be the *principal* cost. The span of the bridge is 250 feet; platform nearly 17

* From the London Mechanics' Magazine, for February, 1850.

wide; clear roadway 15; the masonry at the base 28 feet by 16 feet, and built solid up to the roadway 19 feet high, above which each arched entrance is $12\frac{1}{2}$ feet wide and 20 feet high; and the top of the piers upon which the chains rest, is 24 feet above the roadway, and the whole tapers three-fourths of an inch to the foot in elevation, excepting four feet of plumb which supports the arches. It is built of the best granite, of rock-work, without a tool-mark visible above the road. The care and attention of the workmen were devoted to making good beds and joints for the substantiality of the structure. The versed sine of the bridge is one-tenth of the chord line, and it consumed 40 tons of wrought and cast iron. The section of the four chains at the top of the piers is 50 inches, which taper to 0 at the centre of the bridge; hence its strength for transit use is 250 tons, namely, about one-third of its ultimate power. The platform contains 3600 feet of surface, which will admit of 360 head of cattle being upon it at one time, and this will be the heaviest load to which it will be subject. Now, allowing each to weigh 4 cwt., the load will be only 72 tons, which will leave a surplus power of 178 tons.

"The foundation stone was laid on the 6th of August last, and, deducting the time lost by inclement weather and short days, the bridge was only three months in building. The first bridge on this plan was the Victoria, in Bath, erected in 1836, and now there are nearly fifty. The British and Indian Governments have adopted it, and many others, as well as Lochiel, and it is beginning to be appreciated in every quarter."

Deflexion of Iron Girders.*

It is considered that girders should not deflect more than $\frac{1}{800}$ th to $\frac{1}{400}$ th of their length, according to the form of the girder. It does not appear, from the evidence given before the Strength of Iron Commission, that a weight equal to what a girder is constructed to carry, will, even if left on for any length of time, cause the deflexion of the girder to increase, unless subjected at the same time to considerable changes of temperature. Some experiments made by Mr. Fairbairn and Mr. Braidwood show that iron loses a considerable proportion of its strength when heated to a temperature of more than 220° F., and that it becomes uncertain below 32° . Mr. Clark described the effect of the sun coming out and shining on the Conway tubular bridge for half an hour to have been to raise the tube vertically one inch; and he mentions that, at night, from the lower temperature, the deflexion was always greater than in the day-time. Mr. Fox instances the effect of frequent and great changes of temperature on some short girders, 6 feet long, which support the hoods of the forges in his workshops. In the day-time they are so warm that the hand can only just bear the heat, and at night they become cold. The effect is to make the girders *swag*, and the swagging appears to be continually increasing. Some have attained as much as 3" deflexion in the centre; but their strength does not seem to be impaired.

The general opinion as to the amount of test which should be applied to girders appeared to be, that the test should amount to twice the greatest

* From the London Builder, No. 366.

load. Mr. Joseph Cubitt would employ three times the greatest load, or half the breaking weight; and Mr. Thomas Cubitt considers it safer to test a girder almost to the extent that would break it than not to prove it at all, as the testing of girders is the only means of discovering defects under the surface, and concealed from the eye. Mr. Brunel, however, thinks that a girder should not be tested with a weight exceeding the greatest load, as the object in testing is to ascertain the soundness of the casting, which may be judged of by its appearance under the load, and all risk of permanent injury should be carefully avoided.

AMERICAN PATENTS.

List of American Patents which issued in November, 1849, with Exemplifications by
CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

1. For an *Improved Method of Flooding and Entering Gunpowder Magazines*; Chas. W. Copeland, Brooklyn, New York, November 6.

The patentee says,—“The nature of my invention consists in improvements in gunpowder magazines for ships, whereby they are rendered more safe from explosions by the action of fire, either in the time of battle or from accidental conflagration; said magazines having also improvements for entering and leaving the same, and for conveying powder into and from it without risk from external fire.”

Claim.—“What I claim as my invention, is attaching to, and combining with, the known magazine, having its ejection and injection pipes for flooding and continuing a circulation of cold water through it, and the governing cocks connected together, a connecting piece to be affected by heat without necessarily coming in contact with fire; this connecting piece being governed by a spring when not caused to operate, and being capable, by the action of heat, to flood the magazine; the whole being arranged or constructed substantially as herein more fully described. I also claim attaching and combining with the powder magazine a double tube, or equivalent arrangement, by which articles may be conveyed into or from the magazine, without in any way exposing the interior of the magazine to fire from without; by which several arrangements a perfect security is effected against firing the magazines of vessels of war; all of which is fully described herein.”

2. For an *Improvement in Lathes for Turning*; Hammond Doane and Allen Goodman, Dana, Worcester county, Massachusetts, November 6.

The patentees say,—“The nature of our invention consists in the arrangement of a series of cam patterns on a vertical shaft, in combination with the tool-stock of a lathe, to govern or guide the cutting tool, to produce two or more different patterns on circular wood, or other such works, on one piece, on the way of its length, such as upon such kinds of work as table legs, bed posts, &c.”

Claim.—“What we claim as our invention, is the combination of the sliding cutter-stock, the friction wheel, and two or more patterns, the spindle, and the changing lever, substantially as herein described, and for the purpose set forth.”

3. For an *Improved Arrangement of Engine for Using Steam Expansively*; John Ericsson, City of New York, November 6.

The patentee says,—“The leading feature of the new engine consists in the proportioning and combining its various parts in such a manner that the amount of force transmitted to the crank, during the first and second halves of its semi-revolutions, shall be alike, although the steam be expanded upwards of twenty times, and notwithstanding the extreme irregularity of such high degree of expansion.”

Claim.—“What I claim as new, is placing the axis of the crank-shaft of single acting beam engines, in which the steam is applied expansively, nearer to a line parallel to the axis of the cylinder, and passing through the axis of vibration of the beam on the principle specified, and

for the purpose of obtaining a more regular mechanical action on the crank, by the application of the expansive principle of steam, as described.

"I also claim the employment of two single action expansion crank engines, with their cranks on one and the same shaft, and on opposite sides of the centre: that is, at an angle of 180°, substantially as described.

"And I also claim, in expansion engines, having two cylinders, with pistons moving in opposite directions, and connected with cranks on opposite sides of the centre, in one of which the steam acts by expansion alone; having one end of the large or expansive cylinder at all times in connexion with the condenser, and the other alternately in connexion with the condenser, and the steam end of the smaller cylinder, that the large piston, during its return stroke, may have a vacuum on each side, as described; when this is combined with the smaller cylinder connected with the boiler, and so arranged as to have both ends in connexion with one end of the larger or expansive cylinder, so that when the piston of the smaller cylinder is acted upon on one side by the steam, there shall be a vacuum on the other side, and when the steam is acting by expansion on the larger piston, it shall be in connexion with both ends of the small cylinder, as described. I do not wish to be understood as claiming the mode of connecting the small and the large expansion cylinders, when so arranged that the two pistons are connected and move together and in the same direction, for this was known before in what is known as the Leghwater Engine; but I do claim it when arranged as, and in, the combination herein specified.

"And thirdly, in combination with the two-throw crank shaft, having the two cranks on opposite sides of the centre, the making of the second of the two engines so connected of greater capacity."

4. For *Improvements in Looms for Weaving Figured Fabrics*; Richard Garsed, Frankford, Philadelphia county, Pennsylvania, November 6.

The patentee says,—“My improvement consists of a combination of a pattern wheel directly with the heddles of a loom, and in the distribution and working of the patterns on said cylinder or wheel.”

Claim.—“What I claim as new, is, 1st, operating the heddle frames by the direct application of a cylinder to them, substantially in the manner and for the purpose set forth.

“2d, I claim the mode of changing the pattern, by having several patterns on one cylinder, and, at each operation, turning the cylinder so far as to pass over the intermediate patterns, and bring the desired ones under the heddle frames, as above described.

And I also claim the apparatus for turning the cylinder, substantially as specified, whereby the cylinder can be turned through a greater or less arc as may be required, substantially as described.”

5. For an *Improvement in Mowing Machines*; Daniel K. and John K. Harris, Allensville, Switzerland county, Indiana, November 6.

Claim.—“What we claim as our invention, is the construction and use of the mortise or guide-slot, in combination with that for the axle of the driving wheel, for the purpose of allowing the wheel or thills, or both, to rise and fall without elevating or depressing the blades.”

6. For an *Improvement in Corn Shellers*; Carter, Harris & Carter, assignees of D. W. Harris and E. P. Carter, Yorkshire, Cattaraugus county, New York, November 6.

The patentees say,—“Our invention consists of a fluted feed roll, by which the ears of corn are fed into the sheller with their axes always parallel to that of the cylinder, and in a peculiar construction of the concave, by which the grains receive an oblique rub, which detaches them more easily from the cob.”

Claim.—“What we claim as our invention, is constructing one or more of the bars of the concave in hinged sections, which turn in an arc whose axis is at right angles to that of the cylinder, whereby the ears are subjected to opposite and oblique rubs, which facilitate the stripping of the grains from the cobs.

“2d, Feeding the corn into the throat of the sheller by means of a fluted roll, which delivers the ears with their axes parallel to that of the cylinder, whereby the breaking of the cobs is prevented, and the shelling is expedited.

“3d, The employment of the hinged gate, to prevent the ears from being fed into the sheller either endwise or too rapidly.”

7. For an *Improvement in Winnowing Machines*; A. J. Howell, Spruce Hill, Juniata county, Pennsylvania, November 6.

The patentee says,—“The nature of my invention consists in the peculiar mode of suspending and working the fans, by which I effect a more perfect separation of the seed from the chaff with the same amount of labor, than by any other mode with which I am acquainted.”

Claim.—“What I claim as new, is the combination and arrangement of the horizontally sliding screen and shaking shoe, operated in the manner and for the purposes set forth.”

8. For an *Improvement in Regulators*; J. F. Mascher, Philadelphia, Pennsylvania, November 6.

The patentee says,—“The nature of this invention consists in dividing the rim or curb of a fly or balance wheel into two or more parts, the one being independent of the other, and making the wings of a fan movable, and attaching the divided parts of the fly wheel, and the fan wheels, to the shaft geared to the machinery of a clock, watch, musical clock or box, steam engine, or other machinery whose motion is to be regulated, by means of spiral or other springs, in such a manner as to admit of the divided parts of the wheel, and the wings of the fan, to recede from the centre of the shaft by centrifugal force, a sufficient distance to regulate the motion to the required speed; the former by inertia, and the latter by the increased resistance of the air to their surfaces in their passage through the same.”

Claim.—“What I claim as my invention, is the combination and arrangement of the radial arms and arms C, arranged in pairs, spiral springs surrounding the same, fan wings and segments of a rim of circular curb, for regulating the speed of machinery, substantially in the manner herein set forth.”

9. For an *Improvement in Harness Hames*; Charles Pope, Syracuse, Onondaga county, New York, November 6.

The patentee says,—“My improvement consists in giving the inner edge of the hame a concave shape, which concavity (in the edge of the hame) corresponds with, and fits accurately to, the roll upon the collar.”

Claim.—“What I claim as my invention, is the giving the inner edges of harness hames a concave form, for the purpose of enabling them to be fitted with much greater accuracy to the roll upon the collar, and thereby securing them against displacement, substantially as set forth.”

10. For an *Improvement in Rice Hullers*; D. H. Southworth and James R. Hitchcock, City of New York, November 6.

Claim.—“What we claim as our invention, is, 1st, the employment of rows of brushes on a rotating stock, in combination with a surrounding wire gauze cylinder, when the said rows of brushes or rubbers are made with their forward edges beveled, or with the equivalents thereof, substantially as described, whereby the entrance of the rice or other grains between the brushes and the surrounding cylinder is insured, as described.

“2d, The rows of inclined feeders or conductors, in combination with, and interposed between, the rows of brushes or rubbers, substantially as described, for the purpose of conveying the rice or other grain through the machine, as described; and this is claimed in contradistinction to inclined feeders and conveyors used at the end of the brushes.

“3d, The rubbers, made of India rubber, at the feeding-in end of the machine, in combination with the brushes, substantially as described, for the purpose of hulling the grain preparatory to the operation of the brushes.

“4th, The polishers, made of lambs' wool or other equivalent substance, at the delivery end of the machine, in combination with the brushes, substantially as described, for the purpose of polishing grain preparatory to its delivery, as described.

“5th, Connecting the brushes with the stock by adjustable means, substantially as described, for the purpose of adjusting the periphery of the brushes to the wire gauze cylinder, as described.

“And finally, Making the inclination of the face of the feeders or conveyors adjustable relatively to the axis, substantially as described, for the purpose of regulating the passage of the grain through the machine, substantially as described.”

11. For an *Improvement in Pendulum Balances*; Elnathan Sampson, Claremont, Sullivan county, New Hampshire, November 6.

The patentee says,—“The nature of my improvements in pendulum platform balances, con-

sists in the mode of arranging the levers for the platform, and adapting the pendulum balance thereto, so as to weigh either ounces or pounds with the same index and scale."

Claim.—"What I claim as new, is the combination of a pendulum balance, having a wing or fan attached thereto, to prevent its vibrations, substantially as described, with the adjustable counter-balanced platform for weighing, interposing the chain and cam in the manner set forth.

"I claim also, in combination with the above apparatus, the scale for small weights, so arranged, in connexion with the levers of the platform scales, as to have the same index indicate the weight of articles placed on either the large or small balance.

"And lastly, I claim the arrangement of the platform levers, both working in one direction, with the adjustable weight appended thereto."

12. For an *Improvement in Seed Planters*; John W. Sherman, Ontario, Wayne county, New York, November 6.

Claim.—"What I claim as my invention, is the combination of the spring catch with the levers, substantially in the manner and for the purpose set forth.

"The combination of the device (consisting of the rod connected with the short arm of the lever) for opening and closing the register, with the devices for gearing and ungearing the seed roller, and raising and depressing the drill teeth, as described."

13. For an *Improvement in Grease Boxes for Axles*; John M. Smart, City of New York, November 6.

The patentee says,—"In my improved railroad box, the semi-cylindrical box which rests on the journal is fitted to a cap-plate, provided with side flanches which embrace the semi-cylindrical box, and which are adapted to fit and slide within the sides of the lower half of the box or case, which is formed with a cavity for holding cotton waste or other fibrous substance, which, by capillary attraction, receives the oil and supplies it to the journal of the axles as it rotates, but this recess is surrounded by another cavity, that extends around the two sides and the outer end, to receive the oil, into which the ends of the cotton waste extend over to receive the oil and carry it over by capillary attraction. There is also a recess or cup at the inner end of the cup and under the enlarged part of the journal, which is also filled with cotton waste or other fibrous substance, to catch and retain all the oil which is carried over by the journal. The lower part of the case or box is connected and secured to the cup by means of two or more screw-bolts, which pass through appropriate ears, and which are tapped into the cap-plate, so that, by simply unscrewing these bolts, the lower parts of the case, with the oil and cotton waste, or other fibrous substance, can be removed and cleaned without the necessity of removing the axles from the cars, an operation which is indispensable with all other boxes, and which is attended with much labor and difficulty."

Claim.—"What I claim as my invention, is the auxiliary oil cup, which holds the cotton waste or other fibrous substance under the journal, when said combination is effected by means of the partitions, substantially as herein described."

14. For an *Improvement in Carpet Cleaning Machines*; Joseph Wentworth, Palatine, Montgomery county, New York, November 6.

Claim.—"What I claim as my invention, is the application of the recoil strokes of elastic rods from tension, as described, to successive portions of a carpet or other fabric, moved over rollers in sliding frames, made adjustable by means described, by means of which the carpet or other fabric is rapidly and smartly beaten, and thereby cleansed from its dust and other impurities, and otherwise improved."

15. For an *Improvement in Tailors' Measures*; James M. Whitham, Washington, Washington county, Pennsylvania, November 6.

Claim.—"What I claim as my invention, is the arms in the symmetrical rule, in combination with the dial plates, to which they are attached by pivot joints, as described."

16. For an *Improvement in Apparatus for Raising and Carrying Water*; James D. Willoughby, Scotland, Franklin county, Pennsylvania, November 6.

The patentee says,—"The nature of my improvement consists in a carriage of peculiar construction, by which a bucket can be conveyed a long distance from the point where the

water is required, and lowered into a well, and returned to the operator, without requiring him to leave his post."

Claim.—"What I claim as my invention, is the arrangement and operation of the cord: that is to say, passing it round a pulley at or near the highest part of the track, substantially as set forth, whereby the carriage can surmount any elevation intervening between the well and the point where the water is to be delivered, without the use of a return cord."

17. For an *Improved File Supporter*; Jerome B. Woodruff, Washington City, D. C., and Benjamin M. Townsend, Quincy, Adams county, Illinois, November 6.

The patentees say,—"Our invention consists of a stock, which embraces the saw, and is secured to it by clamp screws; the stock has an adjustable frame mounted upon one of its ends, which is furnished with a pair of parallel rolls by which the file is supported against the saw teeth, the pressure being given by a set of springs acting upon the adjustable frame."

Claim.—"What we claim as our invention, is the combination of the yielding guide rolls, for supporting a hand file during the operation of sharpening the teeth of saws, with the adjustable clamp-stock on which they are mounted, substantially as set forth."

18. For an *Improvement in Fire Engines*; John B. Tarr, Albany, New York, November 6.

The patentee says,—"The nature of my invention consists in combining and arranging an auxiliary brake with a horizontal brake, in such manner that any required number of transverse parallel propelling rods can be attached to them, by which any desired number of hands can exert their physical power to the brakes in a standing position upon the ground simultaneously; thus doing away with the present modes of working the brakes from the top of the engine, which is not only excessively laborious, but limited as to the number of men who can apply their power simultaneously."

Claim.—"What I claim as my invention, is the combination of the horizontal vibrating brakes with the engine, said brakes being so constructed and arranged that any desired number of hands may conveniently apply their united power to the alternate action of the pistons, whilst standing upon the ground in parallel rows, at right angles to the sides of the engine; the handles or propelling rods being so connected with the brakes that they can be brought parallel with, and connected to, them, so as not to extend beyond the sides of the engine when the latter is not in use, by which the advantages enumerated are obtained."

19. For *Improvements in Hemp Machines*; James Anderson, Louisville, Kentucky, November 13.

The patentee says,—"The purpose of my invention is to break and clean hemp or flax, and other fibrous substances, at one operation, or, in other word, by passing it once through the machinery for that purpose."

Claim.—"What I claim as new, is the combination of the grooved rollers, brake, and scutchers or scrapers, substantially in the manner and for the purpose set forth.

"I also claim the scrapers, when employed with any other feeder that shall hold the material firmly while being scraped."

20. For an *Improvement in Pessaries*; Josiah B. Andrews, City of New York, November 13.

Claim.—"What I claim as my invention in the pessary, is the attachment of two stems by hinges to a circular rim, and which two stems may be combined into one stem with two branches, by means of a tube or socket to be slid upon the lower end thereof, in the manner fully set forth."

21. For an *Improvement in Portable Water Closets*; Charles C. Bier, City of New York, November 13.

The patentee says,—"The nature of my invention consists in the construction and use of a pan working on a hinge, within the lower basin of a water closet, so as to be filled with water always when the closet is not in use, but emptied when used, by an arrangement of self-operating levers underneath the foot and seat of the closet; and also in the arrangement of a piston and cylinder under and beside the foot, and another on the under side of the closet-reservoir, operated upon by the levers above mentioned, for regulating the supply and cut-off of water at such times as is required for cleaning the closet."

Claim.—"What I claim is the construction and use of the arrangement of levers, in combination with, and operated upon by, the foot and seat boards of a water closet, for the pur-

pose of opening the pan in the lower basin or trap of a water closet, and regulating the supply of water to the closet-reservoir; also the construction and use of the levers, and weighted lever, in combination with the foregoing arrangement of levers, and operated upon by the seat board, for continuing the operation of supplying the water to the basins from the closet-reservoir."

22. For an *Improvement in Cast Iron Car Wheels*; Thomas S. Bourshett, Little Falls, Herkimer county, New York, November 13.

The patentee says,—"The nature of this invention consists in casting the rim, arms, and enlarged part of the wheel surrounding the hub, hollow, of one uniform thickness, except where the parts join each other, and of a curved form, in such a manner as to allow each of the curved parts of the wheel to yield to the shrinkage, in case the other parts become fixed or cooled first, and the several parts to accommodate themselves to each other without danger of breakage in cooling;—the wheel thus formed being light and strong, and capable of bearing, without injury, the straining, racking, and twisting usually exerted on car wheels."

Claim.—"What I claim as my invention, is the combination of the curved hollow arms with the hollow rim, made semi-circular on its inner part, and hollow curved hub, enlarged and forming a continuation of the flaring of the inner ends of the arms, for causing all the parts of the wheel to accommodate themselves to each other in shrinking or cooling, substantially in the manner and for the purpose herein set forth."

23. For an *Improvement in Binder Pulleys for Belts and Brakes*; Mertoun C. Bryant, Lowell, Middlesex county, Massachusetts, November 13.

Claim.—"What I claim as my invention, is, 1st, to communicate power to machines used for extracting liquids from other matter, by means of a movable binder pulley and a slack belt, the binder pulley being pressed upon the belt by means of a shifting weight, as described.

"2d, To attach to the same part to which is connected the binder pulley, the friction strap or break, so that, by the same movement that the binder is taken from the belt, the break is brought to act upon the machine, to stop it by the means described."

24. For an *Improvement in Ice Cream Freezers*; Goldsmith Coffeen, Jr., Warren county, Ohio, November 13.

The patentee says,—"The nature of my invention consists in causing a blast of chilled air to permeate, be diffused through, and disturb, the liquids and materials of which ice cream is made. I chill the blast by drawing it from the atmosphere into a receptacle which is made to surround the sides and bottom of the vessel containing the ice or refrigerating mass; within this vessel the can containing the liquids and materials of which the ice cream is to be formed is placed, and the interval between the two packed with ice or the freezing compound. The air may be drawn off at a central opening in the bottom of the air chamber. A section of elastic hose is fastened in any usual way to the opening, and similarly attached at its other end to an ordinary double bellows mounted on a suitable frame"

Claim.—"What I claim, is freezing cream or other liquids by forcing through them currents of air, chilled by passing them through chambers artificially cooled, substantially as set forth."

25. For an *Improvement in Seed Drills*; Daniel Custer, Southampton township, Franklin county, Pennsylvania, November 13.

Claim.—"What I claim, is the controlling of the springs by means of the ring, in the manner and for the purpose set forth."

26. For an *Improvement in Curling Hat Brims*; Francis Degen, City of New York, November 13.

Claim.—"I claim as new, 1st, the exclusive application of a changeable curler or former-piece, that entirely surrounds the hat crown and acts on the whole of the brim; and the combination therewith of the pieces *d*, yoke, swinging standard, cam, and lever, to hold a hat in such a manner that the workman may iron and finish the curl on the edges of the brim at one operation, effected substantially as described and shown.

"2d, The combination with the foregoing parts of the winch, lines, and hooks, to draw or turn the cloth on and over the edges of the hat brim, and turn the edges of the hat brim

over the edges of the curler-piece, and hold them there while the workman irons them, so as to set them in the required form, substantially as described.

"3d, I claim the application of the metal cooler-piece, for the purpose of cooling the hat brim so rapidly that the brim shall not have time to warp or change the form previously given to it; the shape of such cooler being conformable to the size and shape of the hat brim, so as to present an even bearing to the under side of the hat brim while cooling, substantially as described."

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27. For an *Improvement in Regulators for Water Wheels, &c.*; James Finlay, Cold Spring, Putnam county, New York, November 13.

Claim.—"I do not claim the conical drums, endless belt, and governor, these having been long known as a means of changing speed; but I claim as my invention the employment of these or analogous arrangements, in connexion with the loose cog wheel herein described, as the means of causing the revolution of said cog wheel to exceed or fall short of the revolutions of said water mill or first mover, whenever such water mill or first mover shall exceed or fall short of its proper speed. The consequence of this variation, through the agency of the screw, bell-crank, and movable plate, (which parts I also claim in combination with those above mentioned,) being either to enlarge or contract the jet apertures, and thereby to increase or diminish the speed of such water mill or first mover, in accordance with the necessities of the case; and this I claim under an arrangement substantially the same with that herein fully set forth, not intending, however, to limit myself to the particular form and connexion of the individual parts, but to vary these as I may find expedient, whilst I attain the same end by analogous means."

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28. For an *Improvement in Machinery for Turning Right and Left Lasts*; Charles Hartsorne and William B. Shaw, Gardiner, Kennebec county, Maine, November 13.

The patentees say,—"The nature of our invention consists in the arrangement and combination of certain mechanical devices by which, from a single reverse pattern, (say of a shoe last,) a corresponding pair of right and left lasts shall be produced simultaneously by the employment of a single rotary wheel of cutters, secured in a vertical adjustive frame, made to move longitudinally with a carriage, and having secured to its opposite end a tracing wheel, which bears against the reverse patterns, and causes the cutter wheel to be moved nearer to, or farther from, the centres on which the lasts turn, in a corresponding degree to the curvatures or inequalities of the surface of the reverse pattern touched by the tracer; the blocks from which the right and left lasts are to be formed being made to turn toward each other, and in contact with the cutters."

Claim.—"What we claim as our invention, is, 1st, the mode of cutting a right and left last, or other article, simultaneously from a single reverse pattern and two blocks of wood, by the before described combination and arrangement of a reverse model tracer wheel, and single wheel of rotary cutters, moving in opposite directions, the tracer wheel being in contact with the reverse model whilst the cutters turn between the two pieces of wood to be turned into a right and left last, the latter turning simultaneously in opposite directions inward and outward against the cutter wheel."

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29. For an *Improvement in Connecting Hubs to Axles*; John Kellogg, Madison, Lake county, Ohio, November 13.

The patentee says,—"The nature of my invention consists in so constructing the axle and interior portion of the hub, that the ordinary linch-pin or nut on the outer end of the axle is dispensed with, and the complete closing of the outer end of the hub, so that no tar or oil can escape, or sand or dirt find an entrance."

Claim.—"What I claim as my improvement, is the introduction of the rod, with the nib working into the cavity, in the manner and for the purposes herein set forth."

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30. For an *Improved Safety Sliding Breech Fire Arm*; J. B. Klein, City of New York, assignee of Charles Hartung, Beichlingen, Prussia, November 13.

The patentee says,—"The first part of my invention consists in adapting a sliding and turning breech-pin to a tube back of the barrel, and in a line therewith, in which tube it can slide and turn for the purpose of inserting and confining the charge in the barrel.

"The second part of my invention consists in fitting the movable turning and sliding breech-

pin to the breech of the barrel, by means of a screw-thread on the end thereof, and in the breech of the barrel.

"The third part of my invention consists in making the breech-pin tube with an inclined face, to act against a projecting part of the breech-pin, to force the breech-pin into the breech of the barrel, and to act as an abutment to resist the force of the discharge.

"The fourth part of my invention consists in locking the turning and sliding breech-pin, when inserted in the breech of the barrel, by means of a sliding bar, which prevents the said breech-pin from turning after the gun has been charged, whether this be used in combination with the screw-thread on the end of the breech-pin, and the inclined face of the tube in which the said breech-pin works, or either of them, or the equivalent of either or both of them.

"The fifth part of my invention consists in combining with the sliding breech-pin, and the punch by which the load is discharged, or the carrier thereof which slides in the breech-pin, a spring-catch, to hold the punch back during the operation of charging the barrel; and this part of my invention also consists in combining this method of holding back the discharging punch with the connexion of the said punch or its carrier with the trigger, whereby the trigger can only act to liberate the discharging punch after it has been liberated by the catch of the breech-pin.

"The sixth part of my invention consists in combining the sliding bar, which locks and unlocks the breech-pin with the catch of the breech-pin, which locks and unlocks the discharging punch, by means of which combination the two operations are effected by the same movement.

"And the last part of my invention consists in making cartridges with a solid cylinder of papier maché, or other equivalent substance, with a recess at the forward end for the ball, and one at the back to receive the priming, the same being so enveloped as to have the charge of powder back of the priming."

Claim.—"What I claim as my invention, is, 1st, the method of locking the breech-pin, when inserted, to prevent it from turning, by means of the sliding bar, substantially as described; and this I also claim, in combination with both or either of the methods of securing the breech-pin by the screw-thread and the inclined face of the breech-pin tube, substantially as described.

"2d, Combining with the sliding breech-pin, and the discharging punch which slides therein, or the carrier thereof, the spring-catch for holding the punch back during the operation of loading, substantially in the manner and for the purpose specified. And I also claim this method of holding the discharging punch, in combination with the connexion of the punch, or the carrier thereof, with the trigger, substantially in the manner and for the purpose specified.

"3d, The combination of the sliding bar, which locks and unlocks the breech-pin with the catch of the breech-pin, which holds and liberates the discharging punch, substantially in the manner and for the purpose specified."

31. For an *Improved Means of Changing the Combination in Revolving Tumbler Locks*; Lewis Lillie, Troy, New York, November 13.

The patentee says,—"The nature of my invention consists of a mode of securing the auxiliary bolt, which enters a recess in the main bolt, to secure it when thrown out, by means of a series of rotating tumblers, notched on their periphery, so that the auxiliary bolt can only be liberated when the notches of all the series of rotating tumblers coincide. My invention also consists in varying the series of notched tumblers in a hinged or vibrating frame, and making their outer peripheries with cogs, and combining them with a series of corresponding cogged tumblers connected with the stationary back plate, so that, when the frame of the notched series is elevated or vibrated sufficiently to disengage the cogs, the other series will be free to rotate, so that the combination may be varied at pleasure to suit any variation in the key, and whilst the key is in place, the vibrating frame may be let down to insure the adjustment of the parts.

"And my invention also consists in operating the main bolt, to throw it in and out, by the rotation of a plate back of the combination tumblers, by having the said plate connected by a joint link with the main bolt."

Claim.—"What I claim as my invention, is hanging the series of rotating tumblers in a hinged or vibrating frame, their outer periphery being provided with cogs, which gear into the cogs of the series of tumblers connected with the stationary lock-plate, so that, when the said frame is elevated, the tumblers of the other series will be free to turn, in order to suit any variation in the set of the key."

32. For an *Improved Method of Fitting the Heaving Socket and Head of Windlasses*; Chas. Perley, City of New York, November 13.

Claim.—"I claim as of my own invention, as new and useful in effect, the application of the boss, with the wrought metal band and square, acting with the bush, to connect the windlass head with the shaft, and at the same time support the heaving socket and flanch, in such a manner that either the head or the heaving socket and flanch, or both, can be immediately replaced when injured: the whole constructed and operating substantially as described."

33. For an *Improvement in Machinery for Splitting and Dressing Rattans*; Sylvanus Sawyer, Templeton, Worcester county, Massachusetts, November 13.

Claim.—"What I claim as my invention, is the principle and combination of the vibrating cutter and guide; to use any number required to remove the whole surface of the cane or rattan, dividing the surface into any required number of strands."

34. For an *Improvement in Leather Dressing Machines*; Charles Slawson, Norwich, Chesham county, New York, November 13.

The patentee says,—“The nature of my invention consists of the passing of the tanned hide or leather over an endless adjustable apron, and beneath a spreader, and between adjustable revolving rollers, by which means I am enabled to scrape, compress, smooth down, and make even the surface, and more compact the body, of the tanned skin, and thus prepare the leather for its completing and finishing processes, in a more expeditious and better manner than under the older and more usual methods and means now in use.”

Claim.—"What I claim as my invention, is, 1st, the adjustable endless apron, in combination with the scraper or extender, for the purpose and uses as herein described; and

"2d, I claim the adjustable scraper or extender, as described, for the purposes and uses of leather dressing, as herein set forth."

35. For an *Improvement in Brick Presses*; Ferdinand Zizemann, St. Louis, Missouri, November 13.

The patentee says,—“The nature of my invention consists in the manner of increasing the pressure on the clay whilst in the moulds, (formed in the periphery of the moulding wheel,) as the pressing wheel descends, by diminishing the distance between the peripheries of the moulding and pressing wheels, by causing the pressing wheel to descend in the arc of a circle of a radius greater than the semi-diameter of the moulding wheel, and scribed from a different centre.

"Also, in a peculiar construction of an apparatus for distributing fine sand or dust over the moulds, before receiving the clay, to prevent the bricks adhering to their surfaces, so as to allow of their being discharged without breakage at the corners, or any part of their surfaces.

"Likewise in a novel mode of returning the pistons (which also serve as the bottoms of the moulds whilst moulding) to the bottoms of the moulds, by means of a rotary toothed wheel, combined with the moulding wheel, by which it is turned without the aid of any connecting cogged or hand gearing."

Claim.—"What I claim as my invention, is, 1st, the combination of the revolving conical duster with the rotating moulding and pressing wheels, constructed, arranged, and operated in the manner and for the purpose herein set forth.

"2d, I also claim the combination of the rotary toothed wheel with the moulding wheel, for driving the pistons to the bottom of the moulds, after the bricks are discharged therefrom, constructed, arranged, and operated in the manner and for the purpose herein described; said wheel being turned by the action of the moulding wheel in contact therewith, without the aid of any connecting cogged or hand gearing.

"3d, I also claim the manner of increasing the pressure on the clay whilst in the moulds, to form the brick, by diminishing the distance between the peripheries of the moulding and pressing wheels, by causing the pressing wheel to descend in the arc of a circle (13) of a radius greater than the semi-diameter of the moulding wheel, the bearings or boxes of the axle of the pressing wheel being secured to the parallel beams, whose outer ends are made to rise in the arc of a circle, concentric to the arc (13), by means of vertical screws arranged to bear against the under sides of said beams, to raise or lower the pressing wheel, in order to increase or diminish the pressure on the bricks in the moulds, as aforesaid."

36. For an *Improvement in Chronometers for Longitude*; John Sheldon, Millville, Cumberland county, New Jersey, November 20.

Claim.—"What I claim as my invention, is the dial with four hands, which are at right angles to each other, and revolve once in 24 hours; said dial being divided into hours and degrees, substantially in the manner and for the purposes described."

37. For an *Improvement in Ox-Yokes*; John Chase, Craftsburg, Orleans county, Vermont, November 20.

Claim.—"What I claim, is the pinion, and rack-bars working within the beam, in the manner and for the purpose set forth.

"2d, I also claim the two iron plates, as set forth. I also claim the grooves and tongue, in the manner and for the purpose set forth."

38. For an *Improvement in Scythe Snaths*; Luther Cole, Lafayette, Onondaga county, New York, November 20.

The patentee says,—"The nature of my invention consists in curving forward that portion of the scythe snath below the right nib or thole, to such an extent as to form an obtuse angle between the scythe and snath at the point where they are joined, and also in such a manner as to equalize the labor between the right and left hands; whereas, in snaths now in use, the greatest amount of labor falls upon the right arm."

Claim.—"What I claim as my invention, is curving forward that portion of the snath behind the right hand nib or thole, and the extremity to which the scythe is attached, in such manner as to form an obtuse angle between the scythe and snath at the point where they are joined, by which device the left hand and arm are extended forward, previous to the scythe's entering the grass, so that the labor of cutting is performed as much by drawing in the left arm as by forcing around the right, at the same time the position given the scythe allows it to cut the whole length, and is more easily sharpened at the heel with the rub-stone than scythes hung on ordinary snaths."

39. For an *Improved Auger for Boring Earth*; Ashley Crafts and Ebenezer Weeks, Auburn, Geauga county, Ohio, November 20.

Claim.—"What we claim as our invention, is the peculiar construction of the auger, namely, the combination of the spiral lip or shelf, extending the whole, or nearly the whole, length of the spiral twist, with the said spiral twist, which is made to approach the centre gradually till it intersects the shaft or stem, forming an auger of a shape approximating to that of a frustrum of a cone, and being entirely open at the lower end."

40. For an *Improvement in Distilling and Rectifying Spirits*; Carl Falkman, Stockholm, Sweden, November 20; anté dated August 5, 1848.

Claim.—"What I claim as my invention, is the method of purifying and rectifying spirits, or giving any desired scent or flavor thereto, by causing the vapor of spirits to pass through a partial cooler containing the required substances for purifying, rectifying, and impregnating it, substantially as described, whereby the vapor of spirits, in passing through the said apparatus, under the combined action of partial cooling, is concentrated and purified, and separated from water and the substances employed for imparting odors or flavors, as described; and this I claim, irrespective of the kind of substance or substances, separately or connectedly, which may be used for producing the chemical effects on the spirit vapor."

41. For an *Improvement in Machines for Moulding Bricks*; John W. Frost, Croton, Westchester county, New York, November 20.

Claim.—"What I claim as my invention, is the combination of the slotted bar with the levers, pin or bolt, cranks secured to the transverse shafts, connecting-rods attached to the presser, and cogged sector and rack on carriage, for causing the presser to be raised in the moulding-box, simultaneously with the movement of the filled moulds from under the moulding-box, substantially as set forth."

42. For an *Improvement in Ink Fountains*; Elijah Jordan, West Cunningham, Hampshire county, Massachusetts, November 20.

The patentee says,—"The nature of my invention consists in the combination of an ink

fountain or reservoir with a steel pen, a peculiar tracing pen, and a hair pencil, constructed in two parts or sections, one to fit on the other, and having in the lower part a suspended needle or pin, to act as a guide or gate; the object of the ink fountain and the connected parts being to carry a large supply of ink or other marking fluid, for writing continuously a long time, without replenishing the pen or dipping it into the ink in the ordinary way, and to regulate the flow just as it is required in writing or marking."

Claim.—"What I claim as my invention, is the mode of supplying the pen or marking instrument with ink, by the pen or marking instrument acting upon the valve or stopper of the ink fountain, to allow the ink to ooze out of the same when in the act of writing or marking, in the manner substantially as described."

43. For an *Improvement in the Combined Table and Bedstead*; Frank Leslie, Upper Rahway, Essex county, New Jersey, November 20.

Claim.—"What I claim as my invention, is, 1st, the table leaves, in combination with the folding side pieces, for converting a dining table into a bedstead, as described.

"2d, I claim the middle leaf with folding legs, in the manner and for the purposes described.

"3d, I also claim the construction and use of the movable towel frame, in combination with the head board, as described.

"4th, I also claim the construction of the apparatus for washing-stand and ottoman or support on the table, as described."

44. For an *Improvement in Seed Drills*; Jacob Mumma, Hummelstown, Dauphin county, Pennsylvania, November 20.

The patentee says,—"The object of my invention is to secure an equal distribution of seed in the drills, either in ascending or descending hills, to regulate the exact quantity sown per acre, and to distribute the seed in the drill, so that it will be more perfect in its growth, and yield more than those in ordinary use."

Claim.—"What I claim as new, is, 1st, the combination of the plain pulleys, mouth-pieces, and slides, operating as set forth, for regulating the discharge of the grain.

"2d, I claim the conical plates at the lower end of the tubes, for distributing grain."

45. For a *Process for Making Malleable Iron Direct from the Ore*; Moses S. Salter, Horace Norton, and John W. Poinier, assignees of Moses S. Salter, Essex county, New Jersey, November 20.

Claim.—"What I claim as my invention, is the process of manufacturing iron directly from the ore, in a furnace composed of three combined chambers, one above another, all actuated by the same fire, whereof the upper chamber is used for heating and deoxidizing, the middle chamber for fluxing and working, and the lower chamber for reducing and finishing the iron, substantially in the manner and for the purposes set forth."

46. For an *Improvement in Connecting Hubs with Axles*; Elnathan Sampson and A. M. Billings, Claremont, Sullivan county, New Hampshire, November 20.

Claim.—"What we claim as our invention, is the fastening a wheel hub to its axle, by means of an annular groove near the extremity of the axle journal, and a sliding retaining plate, and a spring guard pin, placed within the cap, made fast to the outer end of the hub, to wit, a curved portion of the said retaining plate being forced by the spring into the groove in the axle journal, and securely retained, when in that position, by the spring guard pin, substantially in the manner set forth."

47. For an *Improvement in Hemp Brakes*; Augustine Smith, Mobile, Alabama, November 20.

Claim.—"What I claim as my own invention in the above described circular indented platform mill, with horizontal surface, is the circular indented platform, with the application of the bevel indented roller or rollers on this horizontal indented platform, which gives a coarser and a finer break to suit any thickness of stock, from the coarsest hemp to the finest and most delicate flax, and that it is capable of being extended to any diameter, to receive any number of rollers of any desired weight, and to do any amount of business by the application of any motive power; and the model is intended to show simply the form and position of the bars on the platform, and the form and application of the rollers, viz., it is only intended

to show the principle, and not the mechanism or most convenient mode of application, as the mechanism and mode will vary in almost every instance."

48. For an *Improvement in Sounding Boards for Piano Fortes*; Richard Swan, Jr., New Bedford, Bristol county, Massachusetts, November 20.

The patentee says,—"The nature of my invention consists in the attachment of a sounding case to the under side of the sounding board of a piano, and the making a suitable number of openings in the sounding board, for the escape of the sound from the case, for the purpose of adding power and sweetness to the tone of the instrument."

Claim.—"What I claim as my invention, is the combination of a sounding case with the ordinary sounding board of a piano, (suitably perforated with sound openings,) substantially in the manner and for the purposes set forth."

49. For an *Improvement in Welt Cutting and Splitting Machines*; John E. Tucker, Suffolk county, Massachusetts, November 20.

Claim.—"I therefore claim the combination and arrangement of the two short cylinders, the knife, and chisel, arranged at one end of an ordinary leather-splitting machine, substantially in the manner and for the purpose of forming strips of leather, and cutting them into welts, at one and the same time; and from larger pieces of leather, as specified."

50. For an *Improvement in Curvilinear Saw Mills*; Thomas Dugard, City of New York, November 20.

The patentee says,—"My improvements relate to that class of saw mills in which the saw is made to vibrate on its axis, and to move laterally, that it may be guided to cut curved and diagonal lines; and the first part of my invention consists in hanging the saw gate to slide vertically between finger posts connected together, and which can be made to slide horizontally, to give the lateral movements to the saw, by means of rack and pinions connected with a hand wheel within the reach of the attendant.

"This part of my invention also consists in connecting the pitman or pitmen with the saw gate, by means of a horizontal rod or rods attached to the gate, which slide in a hole in the end of the pitman or pitmen, to allow of the lateral movements of the saw gate, the upper end of the pitman or pitmen being governed by a guide or guides.

"And the second part of my invention consists in vibrating the saw by means of a crank-handle, or the equivalent thereof, on some stationary part of the frame of the mill, by combining this with a pulley or pulleys, or the equivalent thereof, on a rock shaft or shafts in the saw gate, which slides through the said pulley or pulleys by a feather or its equivalent, the said rock shaft or shafts being connected with the stirrups of the saw. And this part of my invention also consists in combining a vibrating guide, which embraces the saw, and through which it slides, with the rock shaft or shafts, that the saw may be guided and kept in the required position near its point of action on the timbers."

Claim.—"What I claim as my invention, is hanging the saw gate to slide in fender posts, framed together and sliding horizontally to give the required lateral movements to the saw, substantially as described, when this is combined by rack and pinion with a shaft and hand wheel, or the equivalent thereof, under the control of the attendant, substantially as described.

"I also claim, in combination with the above described method of hanging the saw gate, to give it the required lateral movements, connecting the pitman or pitmen with the saw gate, by means of a horizontal rod or rods on the saw gate, and governing the upper end of the pitman or pitmen by a guide or guides, substantially as described.

"I also claim the method, substantially as herein described, of vibrating the saw by means of a rock shaft or shafts connected therewith, and hung in the saw gate, in combination with the pulley or pulleys, or the equivalent thereof, through which the shaft or shafts slide, as described; the said pulley or pulleys, or the equivalent thereof, being combined with a crank-handle, or its equivalent, on some stationary part of the framing, as described.

"And finally, I claim, in combination with the rock shaft or shafts, the vibrating saw guide connected therewith, substantially in the manner and for the purpose specified."

51. For *Improvements in Flood Gates for Fences*; S. D. Hopkins, Brookville, Albemarle county, Virginia, November 20.

Claim.—"I do not claim the barrel, rollers, and pulley, as my invention when used separately, but what I do claim as my invention, is the combination of all the parts with the

framework above described, so combined and applied as to produce the self-working flood gate, as above described."

52. For an *Improvement in Sofa Bedsteads*; John A. Robson, City of New York, November 20.

The patentee says,—"The nature of my invention consists in sliding the seat of the sofa out to the front, and dropping the upholstered part of the back, which is the same on both sides, out of the frame and towards the front, meeting and resting against the inner edge of the seat, thus forming a double spring mattress bed."

Claim.—"What I claim as my invention, is the letting of the upholstered part of the back fall forward, to meet and rest against the rear or back edge of the seat to form the bed, without moving the sofa from its place, or disturbing any part of the frame, as described."

53. For a *Combination of a Double Traveling Hearth with a Blast Furnace*; Lorenzo Sibert, Woodstock, Shenandoah county, Virginia, November 20.

The patentee says,—"My improvement is for the purpose of converting iron directly from the blast furnace into malleable iron, by a peculiar construction of the furnace, whereby I am enabled to keep up the heat in the blast furnace without interruption while decarbonizing the iron."

Claim.—"What I claim as new, is the combination of the double traveling hearth with a blast furnace, in the manner and for the purpose as set forth."

54. For an *Improvement in Platform Scales*; Thaddeus Fairbanks, St. Johnsbury, Caledonia county, Vermont, November 20.

Claim.—"What I claim as new, is the combination of the pivot or bearing frame, or primary platform, the blocks of rubber or spring contrivances, and the superior platform with the weighing levers or mechanism; the whole being substantially in the manner and for the purpose as specified."

55. For an *Improvement in Machines for Folding Paper*; Jas. H. Gray, Springfield, Hampden county, assignee of Edward N. Smith, West Brookfield, Worcester county, Massachusetts, November 27.

The patentee says,—"My invention consists in a series of moving plane surfaces, one above the other, framed of endless bands, on which the paper is extended, and by which it is carried through the machine."

Claim.—"What I claim as my invention, is folding sheets of paper or other flexible substance by machinery, made and operated substantially upon the principle herein set forth: that is to say, by striking the paper or other substance upwards in the line in which the fold is to be made, from a surface on which it has been extended, and seizing it between converging surfaces which complete the fold and deliver the folded paper, irrespective of the number or forms of the surfaces employed, and of the number or forms of folding edges required to give the requisite number of folds to the paper, irrespective, also, of the arrangements and devices for operating the several members of the machine."

56. For an *Improvement in Flour Bolts*; George W. Brown, Jackson, Jackson county, Michigan, November 27.

The patentee says,—"The nature of my invention consists in reversing the order of bolting, running the meal over the coarse cloth first, using wire instead of coarse cloth, thereby preventing any and all hard substances from passing over the surface of the superfine cloth, allowing nothing to pass out to the superfine cloth except the flour and middlings; and also the use of zinc or other metallic substance in and about the reel, chest, and spouts, for the purpose of cooling the flour after it is separated from the bran and shorts; also the use of one cloth inside of the other upon the same reel, and round arms and three square ribs."

Claim.—"What I claim as my invention, is the arrangement of the bolting cloths upon a reel of any convenient construction, in such manner as to run the meal over the coarse cloth first, and the use of zinc or other metallic substance in and about the bolts, to operate as a cooler upon the flour after it is separated from the bran and shorts."

57. For an *Improvement in Butter-Working Machines*; Elias H. Merryman, Springfield, Sangamon county, Illinois, November 27.

Claim.—"What I claim as my invention, is the use of two or more rollers, with adjustable scrapers held in contact with the rollers by springs or other devices, operating in a vat of running water, to wash butter, and separate the broken capsules, cheesy matter, butter-milk, and other impurities, by dissolving those that are soluble in water, and washing away those that are not soluble, substantially as described; the water being let into the vat from a cistern above the level of the vat, and escaping at the spout on a level with the journals of the rollers."

58. For an *Improvement in Brick Presses*; Arad Woodworth, 3d, Worcester, Worcester county, Massachusetts, and Samuel Mower, Philadelphia, Pennsylvania, November 27.

Claim.—"We are aware that the mere employment of a ram or falling weight to produce density is not new; consequently we do not claim such, nor do we claim as our invention the combination of the percussion ram and its piston, (whether connected to it or separated from it,) the brick-mould, and lower expulsion piston; the whole being made to operate in such manner on clay in the mould as to compress said clay, and afterwards expel it from the mould; but we do claim, as auxiliary thereto, and in combination therewith, machinery for holding the ram and its piston stationary, just subsequent to its first blow, and elevating the lower piston in the mould, in order to produce direct compression on the lower face of the brick, in manner and for the purpose as above stated, the machinery employed for such purpose being the forked slide bar, its projection, the projection on the ram, and the cams which operate the slide bar and lower piston, as specified.

"We wish it understood that we make no claim to a sliding mould-charger, in connexion with a mould and hopper, as constructed and made to operate prior to the date of our invention; but what we do claim as our improvement, is to so construct and use the sliding charger, in connexion with the ram piston, as above specified, as to render it (the said charger) a part of the mould during, and for some time after, the first percussion of the ram, the same being for the purpose of attaining certain advantages we have above maintained.

"We further claim the weighted or spring scraper, in its combination with the carriage and the mould plate, and for the purpose of cleaning the top surface of the mould plate, as described.

"We also claim to so construct the mould with the flaring or inclined sides, and combine them with mechanism for lifting the brick a short distance just previous to the second percussion, as specified, as to not only enable the brick to be freed in a measure from its adhesiveness to the mould, but to permit the compressed air, or part of the same, in the immediate vicinity of the surface of the edges of the brick, to escape as explained; the diminution of adhesiveness tending to lessen the friction of the clay against the sides of the mould under the second percussion of the ram."

59. For an *Improvement in Processes for the Manufacture of Sugar*; John Scofield, Upper Holloway, England, November 27; anté dated December 8, 1847.

The patentee says,—"My invention consists of the employment of sulphurous acid as a means of separating lead used for purifying or removing coloring and other foreign matters from solutions containing sugar."

Claim.—"What I claim, is the combined use of sulphurous acid with lead, in the manufacture and refining of sugar, substantially as set forth."

60. For an *Improvement in Railroad Trucks*; Jno. F. Rogers, Troy, New York, November 27.

The patentee says,—"The nature of my invention consists in arranging spiral springs within pockets or tubulated casings, and confining said pockets and the journal box into one piece, in such a manner as that the weight of the car shall act upon the springs. I also combine spiral springs in the balance beam within similar pockets, in such a manner as to support the body of the car thereon. In this arrangement of trucks each wheel, in its vertical action, is free from the other wheels of the car, and possesses great lateral stiffness, and is a cheaper mode of construction than any other with which I am acquainted."

Claim.—"What I claim as new, is the arrangement and combination of the journal boxes with the spring casings or pockets, through which bolts are affixed to the frame, and acting as guides to the boxes; the whole being constructed and arranged in the manner and for the purpose substantially as specified."

61. For *Improvements in Machinery for Dressing Flour*; Charles Learned and Stephen Hughes, Indianapolis, Marion county, Indiana, November 27.

The patentees say,—“The nature of our invention consists in separating the fine flour that usually is found adhering to the bran after passing through the flour bolts, and which is usually lost to the superfine barrel, by conducting the bran by an inclined spout through the eye of an upper revolving cylinder of metallic beaters, to a space between it and a lower revolving cylinder of beaters, turning in an opposite direction, where it is struck by a number of concentric rows of four-sided metallic teeth, projecting vertically from the adjacent surfaces of the two opposing cylinders, and separated from the bran, and driven by centrifugal force against a stationary cylindrical bolting cloth, surrounding the revolving cylinders, through which the flour is driven, aided by a current of air, gathered into, and passing down through, the shaft of the upper cylinder, (which is made hollow and suspended by a neck,) to the space between the cylinders; the flour being collected in a scroll-shaped chamber surrounding the cylindrical bolt, which gradually enlarges in its circuit to the outlet, where the flour is discharged, in a tangential line to the circle of the cylinder bolt, in a suitable conducting spout, whilst the bran and flour that failed to pass through the cloth above, are again acted on by the radial wings affixed to the under side of the lower cylinder, causing the remaining flour to pass through the cloth into the scroll space, whilst the bran descends to the bottom of the cylinder bolt, in which there is a discharge opening, through which it passes to a proper receiver; the aforesaid cylinders being turned by bands and pulleys, connected with any suitable and adequate propelling machine, at the rate of about 800 revolutions per minute.”

Claim.—“What we claim as our invention, is, 1st, the employment of a revolving hanging disk of concentric rows of metallic polygonal beaters or cutters, and central hollow suspended shaft, made with curved induction and eduction branch tubes; said hollow shaft serving a double purpose of a hanging shaft and air conductor, for conveying streams of air to the space between the cylinders, in combination with a revolving disk turning in a contrary direction, also armed with concentric rows of metallic polygonal beaters and cutters, and radial wings, arranged and operating in the manner and for the purpose herein fully set forth.

“2d, We also claim the employment of the helical plate, in combination with the cylindrical bolt, for producing the gradually enlarged space into which the flour is received, and from which it is discharged, in the manner herein described.”

62. For an *Improved Form of Teeth in Harvesting Machines*; Eliakim B. Forbush, Buffalo, New York, November 27.

The patentee says,—“The nature of my invention consists in making an open triangular tooth, of any required base and perpendicular, or, in other words, a triangular hollow tooth, which will vibrate with less friction, and clear itself, guard fingers, and case, from all obstructions, when used in reaping or mowing machines.”

Claim.—“What I claim as my invention, is an open triangular tooth, or triangular hollow tooth, for cutting grass and grain, with its results, as described.”

63. For an *Improvement in Instruments for Milking Cows*; Cyrus Knapp, City of New York, November 27.

The patentee says,—“The nature of my invention consists in the making of a sack or pocket of gutta percha, or other suitable material, for the purpose of encasing the teat of the cow. In the lower end of it is secured a small silver tube, through the orifice of which is inserted a gutta percha piston or exhauster. This tube and piston (when the sack is applied to the teat) is passed into the milk duct, when the piston is withdrawn, leaving the orifice of the tube open for the discharge of the milk, in consequence of the artificial warmth, like that of the mouth of the calf, created by the impervious sack, and pressure of the band encircling the neck of it and the teat.”

Claim.—“What I claim, is the sack made of any suitable material, (gutta percha is preferable however,) in combination with the elastic strap, for compressing the teat and neck of the sack, and the exhauster tube and piston, in form and manner and for the purposes herein substantially set forth.”

64. For an *Improvement in Blank Account Books*; Charles Hopkins, City of New York, November 27.

The patentee says,—“The first part of my invention consists in uniting together the blank leaves and inner covers, and uniting them on each side of the back with a strip of metal, or other suitable material, formed with hinged knuckles, when this is combined with the outer

cover or binding made separately, and also provided with corresponding hinge-strips at the inside of the back, so that the cover can be attached to, or detached from, the book, by simply uniting the hinge-strips of the book and cover, by means of rods of wire passing into the eyes or loops of the hinge knuckles.

"And the second part of my invention consists in making the book into sections, each section being bound separately, and provided with hinged strips, such as above indicated, so that the several sections can be connected together or separated, and also connected with, or disconnected from, the outer cover or binding, whereby a continuous ledger or account book may be made, the several sections, as they are filled up, being removed, and other sections put on."

Claim.—"What I claim as my invention, is connecting the leaves of a book with the cover, by means of hinged strips attached to the back of the book and to the cover, so that they can be connected or disconnected, by means of wires passing through the eyes or knuckles of the hinge-strips, substantially as described, whereby the book can be disconnected from, or connected with, the cover, as described.

"And I also claim making a book in sections, when the sections are provided with hinged strips, substantially as herein described, so that they can be connected with, or disconnected from, each other and the cover, substantially as described."

65. For an *Improvement in Rotary Pumps*; Peter Swecney, Buffalo, New York, November 27.

The patentee says,—"My invention consists in constructing the revolving piston in such manner that it shall yield to, and pass by, any obstruction which may lodge in its passage through the pump chamber, and which would otherwise injure the pump. Likewise, in so connecting the valves with a double cam wheel that they shall be raised at the proper time to allow the piston to pass, this cam wheel being made heavy, so as to serve also the purpose of a fly wheel."

Claim.—"What I claim as my invention, is the construction of each arm of the piston in such manner that, while it is ordinarily kept in its proper position by the pressure of the water, its lower edge will yield to, and pass over, an obstruction which would otherwise break the pump."

66. For an *Improvement in Glazing Pottery Ware*; Christopher W. Fenton, Bennington, Bennington county, Vermont, November 27.

Claim.—"What I claim as my invention, is the coloring of the glaze of pottery ware by means substantially as set forth and described."

67. For an *Imprvement in the Combined Plough and Seed Planter*; William Croasdale, Hartsville, Bucks county, Pennsylvania, November 27.

The patentee says,—"The nature of my invention consists in so constructing a feeding apparatus (without the usual frame, handles, beam, cultivator and tubular teeth, covers, &c.) as to become an attachment of a common single furrow plough, by which the seed can be sown simultaneously with the first or second ploughing, and by which the expense of one ploughing is saved, and the apparatus adapted to strong, stumpy, and other rough land, where the ordinary wheeled seeding machine, containing a combination of cylinders and tubular teeth, cannot be used, and by which the larger and expensive machinery now employed as a separate machine can be dispensed with."

Claim.—"What I claim as my invention, is the construction of the seed planter, as described, consisting of a seeding apparatus, combined with a single furrow plough, as described, so as to sow the grain at the first or second ploughing, in the manner and for the purpose herein fully set forth."

68. For an *Improvement in Boring Machines*; James H. Aldrich, Portsmouth, Rockingham county, New Hampshire, November 28.

Claim.—"What I claim as my invention, is the combination of three principles, namely, 1st, the manner in which the bed-piece, to which the carriage is connected, is raised or lowered, as above described; 2d, the manner in which the bed-piece may revolve, to set the auger at any angle or degree; 3d, the manner in which the auger is withdrawn by the direct motion of the crank."

69. For an *Improvement in Stop-Cocks and Filters in Combination*; Abraham and Henry Johnson, City of New York, November 27.

Claim.—"What we claim as our invention, is an improvement on the filtering cock secured to us as aforesaid, and is the arrangement of the water passages in the central pipe, in combination with the filters having two chambers, with a water passage leading from each chamber, and a recess, substantially as described, whereby filtered or unfiltered water can be drawn, and the filtering action reversed as described."

70. For *Improvements in Machinery for Twisting Shawl Fringe*; Bay State Mills, assignee of Milton D. Whipple, Lowell, Massachusetts, November 27.

Claim.—"What I claim as my invention, is, 1st, dividing the yarns into proper quantities for the formation of the two strands, by means of the dividing plates and separator, shaped, and made to slide up and down, substantially as set forth.

"2d, I claim twisting the two strands separately at first and then together, by means of the twisting finger or rubbers, constructed and arranged so as to turn inwards and outwards over each other, one above and the other below the yarns, substantially as set forth.

"3d, I claim the peculiar construction and arrangement of the separator, as I have termed it, so that it may open over the rubbers, and drop down just before the two strands are to be twisted together, substantially as described.

"4th, I claim a machine for twisting the fringes of shawls, &c., having a stretching frame, dividing plates, and separator, twisting fingers or rubbers, combined and operated successively as hereinbefore specified and described."

71. For an *Improvement in Machinery for Dressing Barrel Heads*; Timothy Shepard, Oswegatchie, St. Lawrence county, New York, November 27.

The patentee says,—"The nature of my invention consists in providing a way for turning the face or top of the head, and the edge and bevels of the same, at the same operation."

Claim.—"What I claim as my invention, is the application of the shield, with the orifice and rest attached to the same, in combination with the plane to prepare the large bevel."

72. For an *Improved Method of Regulating the Blow-Off Valve of Steam Boilers*; Charles W. Copeland, Brooklyn, New York, November 27.

The patentee says,—"My invention consists in improvements in the method of discharging that portion of the water from the boilers of steam engines known as the 'blow-off' water."

Claim.—"What I claim as my invention, is regulating the blow-off water by the action of the feed water, so that said blow-off water will always bear a certain proportion to the quantity fed, which ratio must vary according to circumstances, and so as to cease entirely when the feed ceases to enter the boiler.

"2d, I claim the combination of the blow-off valve with the check valve, in such manner that the blow-off valve will be operated by the stem of the check valve; the whole being arranged and constructed substantially in the manner and for the purpose set forth."

73. For an *Improvement in Propellers*; John Patch, Boston, Massachusetts, November 27.

The patentee says,—"The nature of this invention consists in attaching to a horizontal shaft, passing through a stuffing-box in the stern part of the vessel, on either side of the rudder, a sufficient distance below the surface of the water, four spiral segmental plates, arranged in reverse positions and connected together at their outer extremities, in such a manner that when said shafts are revolved with a proper degree of speed, the surfaces of the spiral segmental plates will be caused to strike the water at such an angle with the line upon which the vessel moves, as to cause the vessel to be forced or propelled forward with a speed commensurate with the size of the spiral plates, and the power applied to the same."

Claim.—"What I claim as my invention, is the propeller constructed of two spiral, curvilinear, tapering plates, formed and secured to the shaft, as represented and described, and connected together at their outer extremities; and this I claim, irrespective of the number of sets of these propellers that may be placed on one shaft, or of the number of shafts that may be used in propelling one vessel."

74. For a *Method of Ringing Fog Bells, and an Adjustable Clapper for the Same*; Daniel Jones, Jr., St. Johns, New Brunswick, November 27; anté dated August 22.

The patentee says,—"My invention consists in ringing a bell by machinery, in such man-

ner that the sound may be varied at will, so as to make different signals to approaching vessels. I have likewise so constructed the clapper, that the blows struck by it in different positions of the bell shall always be equal in intensity."

Claim.—"What I claim as my invention, is indicating to vessels the position of channels, shoals, or reefs, the depth of water, or state of the tide or currents, at the entrance of harbors or elsewhere, by the varying ringing or tolling of a bell operated by adjustable machinery, substantially as set forth.

"I also claim the combination of a shifting weight with the clapper, whereby its blows upon the bell, in the several positions in which it strikes the same, are equalized."

RE-ISSUE FOR NOVEMBER, 1849.

1. For an *Improvement in Looms for Weaving Brussels Carpeting, &c.*; Erastus B. Bigelow, Clintonville, Worcester county, Massachusetts; patented March 13, 1849; re-issued November 20, 1849.

The patentee says,—"My improvements consist in giving to the lathe of the loom a counter motion, whereby the reed may be made to approach nearer the face of the cloth at some of its beats than at others, for the purpose of properly laying the filling to form the pile of the cloth, and carrying the trough or grooved bar, employed to carry the wires between the warps, or the equivalent thereof, forward to clear the shed before it is withdrawn therefrom."

Claim.—"What I claim as new, is, 1st, giving to the lathe of the power loom a counter motion, to vary the extent of its approach towards the face of the cloth at any required beat, to properly lay the filling to form the pile of the cloth, or clear the shed as above specified.

"2d, Moving the trough or grooved bar, which is employed to carry the pile wires under the warps, or the equivalent thereof, forward towards the face of the cloth, to clear the shed as above described, or in any other way which shall accomplish the same end by substantially the same means."

ADDITIONAL IMPROVEMENTS FOR NOVEMBER, 1849.

1. For an *Improvement in Machines for Threshing and Cleaning Grain*; B. G. H. Hathaway, Rockstream, Yates county, New York; patented July 5, 1848, additional improvement annexed November 6, 1849.

Claim.—"What I claim, is, 1st, the modification of the shoe by the employment of the cover, as specified, to the upper spout, and forming an offset and opening together with the spout, as described.

"I also claim the concave, made adjustable and reversable, in the manner and for the purposes set forth."

2. For an *Improvement in Seed Planters*; James D. Willoughby, Chambersburgh, Franklin county, Pennsylvania; patented June 5, 1849, additional improvement annexed November 20, 1849.

The patentee says,—"The nature of my improvements consists, 1st, in the method of connecting the beam of the share with the framework of the machine; 2d, in the method of depressing the shares, and holding them below the surface of the ground; 3d, in the device for stopping the discharge of seed; 4th, in the device for holding the shares in their proper position for ploughing seed furrows, which is so arranged that it will afford sufficient resistance that it will divide the earth through which the share passes, but shall give way and allow the share to move backwards, whenever the latter strikes a stone, stump, or other obstruction, with a force which would otherwise break the machine."

Claim.—"What I claim as new, is hinging the teeth to the frame or beam, and bracing them by flexible struts, which possess a sufficient rigidity to resist all ordinary strains to which the teeth are subjected without flexing, but which suddenly yield and allow the teeth to turn back when they meet with an obstruction which would otherwise break or stop the machine, as described and represented."

DESIGNS FOR NOVEMBER, 1849.

1. For a *Design for Stoves*; Morrison & Tibbits, assignees of Abram Hancy, Troy, New York, November 6.

2. For a *Design for Stoves*; E. Johnson and D. B. Cox, assignees of Samuel Clark, Troy, New York, November 13.
3. For a *Design for Stoves*; Johnson & Cox, assignees of Samuel Clark, Troy, New York, November 13.
4. For a *Design for Stoves*; Johnson & Cox, assignees of Samuel Clark, Troy, New York, November 13.

The claims to the above are to the designs of ornaments, mouldings, scrolls, &c., as described in the several specifications.

List of American Patents which issued in December, 1849, with Exemplifications by
 CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

1. For an *Improvement in Mills for Grinding*; Sidney A. Bantz and William Andrew, Frederick, Frederick county, Maryland, December 4.

The patentees say,—“Our invention consists, 1st, in giving a vibratory motion to the concave, so that it shall diverge from, and close towards, the cylinder, whereby a drawing motion is communicated to the teeth, which thus cut as well as crush the bark. 2d, In the peculiar form given to the teeth of the concave, which increases their strength, and enables them to act more effectually on the bark.”

Claim.—“What we claim as our invention, is the vibratory motion given to the concave, substantially in the manner as herein set forth.”

2. For a *Method of Counterbalancing Window Sash*; Wesley Chase, assignee of William T. Barnes, Buffalo, New York, December 4.

The patentee says,—“My invention consists in attaching a rack to each sash, the teeth of which gear into those on the opposite sides of the same pinion, the axle of the pinion being attached to a hinged spring lever, so that it can be thrown out of gear with the rack of one sash, and at the same time locked in such a manner that it is prevented from being turned by the weight of the other sash.”

Claim.—“What I claim as my invention, is the arrangement herein described of the hinged lever, pinion, and racks, with respect to a couple of window sashes, whereby the sashes can be connected and disconnected, adjusted, and counterbalanced, as set forth.”

3. For a *Double Revolving Scraper*; Ashley Crafts and Ebenezer Weeks, Auburn, Geauga county, Ohio, December 4.

Claim.—“What we claim as our invention, is the double cavity or cima-reversa scoop or scraper, whether of the precise shape described, or of any other substantially the same, revolving on pivots, so as to discharge and reload itself without being stopped and righted, irrespective of the particular form of frame in which it is placed, in combination with devices, substantially as described, for fastening and setting free the same.”

4. For an *Improvement in Stone-Dressing Machines*; William Eayrs, Concord, Merrimack county, New Hampshire, December 4.

The patentee says,—“The whole of my invention is to be found not only in the manner in which, or by which, I sustain and operate each of the chisels, but also in the means adopted to produce the blow or percussion thereon, necessary to cause it to remove the surplus material from the block of stone.”

Claim.—“I claim the rotary hammer, as constructed and combined with each chisel-stock, and made to impinge against it, and permit it to immediately afterwards move forwards, preparatory to another blow, as specified.”

5. For an *Improvement in Grain Separators*; S. W. Fisher, Scio, Washtenaw county, Michigan, December 4.

Claim.—“What I claim, is the combination of the raking apparatus with the notched surface under which the irons on the ends of the rakes pass, by which means the rakes are

caused to shake, which motion of the rakes shakes the straw, and thereby separates the grain from it."

6. For an *Improved Frog for Railroads*; Henry A. Landry, Camden, Camden county, New Jersey, assignee of John W. Hoffman, Philadelphia, Pennsylvania, December 4.

Claim.—"What I claim as my invention, is a railroad frog constructed with hinged leaves, acted upon either by weights or springs, essentially in the manner and for the purposes described."

7. For *Improvements in Filis-Cutting Machines*; Camillus Kidder, administrator of George Crosby, Baltimore, Maryland, December 4.

Claim.—"What I claim, is, 1st, the peculiar combination of the spring with the hammer, in the manner and for the purpose set forth.

"2d, The application of a check-bar for the purpose described."

8. For an *Improvement in Cooking Ranges*; Nicholas Mason, Roxbury, Norfolk county, Massachusetts, December 4.

The patentee says,—“The nature of this invention consists in combining and arranging a series of boilers, ovens, flues, dampers, and their necessary attachments, in such relation to each other and the fire chamber, as to form a compact and convenient cooking range, capable of supplying all the wants pertaining to the culinary department, as well as to form a heater to warm the rooms of the house in which it is situated, with a slight amount of fuel, considering the benefits accomplished.”

Claim.—"1st, I claim the arrangement of the flues on the sides, front, back, and bottom of the boiler, formed by the sides, front, back, and bottom of the boiler, and the upright plates provided with valves at the top and brickwork of the range in the manner and for the purposes set forth.

"2d, I also claim the arrangement of the flues on the sides and back of the fire chamber, and the flues under, and at the back part and side of, the oven and horizontal trunk, with valves, and communicating with the apartments to be heated, for heating the air admitted from the cellar or other place by the valves, to the proper degree to be conveyed to the apartments, as described.

"3d, I likewise claim the arrangement of the plates projecting from the plate *l*, and openings in said plate, for dividing the heat, and causing one portion to be carried around the front part of the wash-boiler, and the other portion around the back part of the same, as described."

9. For an *Improvement in Making Artificial Teeth*; George E. Murray, Philadelphia, Pennsylvania, December 4.

Claim.—"What I claim as new, is an artificial tooth having a plate combined therewith, substantially in the manner and for the purposes set forth."

10. For an *Improved Concealed Trigger for Fire Arms*; Jacob Pecare and Josiah M. Smith, City of New York, December 4.

The patentees say,—“The nature of our invention consists in so constructing a revolving or repeating pistol that an accurate aim may be taken: that an assailant party cannot, by grasping the barrels, prevent the assailant from repeating his fire; that the concealment of the trigger, hitherto unattained in revolvers, but particularly desirable in this kind of pistol, is effected; and that the barrels are made to revolve by simple mechanical means; thus combining, in an unusual degree, efficiency of action, security from accidental discharge, portability, and cheapness of construction.”

Claim.—"What we claim as of our invention, is the construction of a concealed trigger, capable of being disclosed and made ready to operate by simple pressure imparted by the hand to its rear end, as described."

11. For an *Improvement in Mills for Grinding*; Samuel W. Powell, Tuscarora Valley, Juniata county, Pennsylvania, December 4.

The patentee says,—“My invention consists in forming helical or screw-shaped ribs on the barrels of two rolls, the surfaces of which are driven with different velocities, so that the

corn is not only crushed between them, but is cut by the sharp edges of the ribs of one roll passing obliquely over those of the other."

Claim.—"What I claim as my invention, is a grinding mill consisting of two rolls, on whose surfaces grooved and fluted helical ribs are formed, and which move with different velocities, the several parts of the machine being arranged and operated substantially as set forth."

12. For an *Improvement in Pumps for Raising Water*; Alexander Stiven, City of New York, December 4.

Claim.—"What I claim, is the annular ring, with radial arm and slot, in the cylinder immediately between the exit and entrance, and giving motion to the annular ring or piston by an eccentric or cam, and the whole operating conjointly together as set forth."

13. For *Improvements in Machinery for Spinning Hemp*; Garret Van Riper, Jersey City, Hudson county, New Jersey, December 4.

The patentee says,—"The nature of my invention, as regards the flyer, consists in composing the ends thereof of circular heads instead of transverse arms, as heretofore used; and, as regards the speed of the bobbin, in regulating the comparative speed of the bobbin by a simple contrivance, susceptible of the nicest gradations, and not subject to any of the inconveniences of the old method of loading."

Claim.—"What I claim as my invention, is the use of a circular-headed flyer, having a circular head at each end, constructed and operating substantially as shown."

"I also claim, in combination with a flanch or shoulder near the foot of the spindle, and permanently attached thereto, the use of a movable friction plate of metal, when the same is pressed to the flanch or shoulder, or upon an interposed washer, by an adjustable spring or lever pressing on both sides of the spindle, and thereby producing a drag or retardation; while, by its longitudinal action, it retains the spindle steadily in its step, at the same time increasing the friction and retardation; whereby I am enabled to impart any required degree of tightness to the yarn as spun, and give it a greater uniformity of texture than can be done by any other known method, as set forth."

14. For *Improvements in Condensers and Stuffing Boxes of Vapor Engines*; Prosper Verdat du Trembley, Paris, France, December 4; anté dated March 10, 1847.

Claim.—"I claim the ether generator or vaporizer, and condenser, constructed substantially as described, whereby I obtain more perfect joints."

"I also claim packing the stuffing boxes, by means of leather, or other analogous substance, surrounding the body to be packed, when the said leather, or other substance, is surrounded by a chamber containing a fluid under pressure, substantially as described."

15. For an *Improvement in Cast Iron Car Wheels*; Hiram H. Wiser, Rochester, New York, December 4.

The patentee says,—"The nature of my invention consists in constructing a railroad car wheel, by combining sunk and raised panels, which I apply to the plates of which the wheel is formed."

Claim.—"What I claim as my invention, is the particular manner of forming my wheel, it being formed of an inside and outside plate; each plate being formed of sunk and raised panels alternately, the space between the raised panels extending from the hub to the tread; the parts of the plates which form the sunk panels join between the hub and the tread, for the purposes substantially as described."

16. For an *Improvement in Detachable Buckle Tongues*; Alvah Worster, Hannibal, Oswego county, New York, December 4.

Claim.—"What I claim as new, is the detachable buckle tongue, constructed and arranged in the manner and for the purpose represented."

17. For an *Improvement in Apparatus for Dyeing*; Edward Brierley, Lowell, Massachusetts, December 11.

The patentee says,—"My process is peculiarly applicable to producing stripes or figures of various colors in cloth; it differs essentially from the usual practice of producing such figures

by imprinting them on the surface of the cloth, as, by my method, they are dyed into and through the cloth during the process of dyeing it."

Claim.—"What I claim as my invention, is the above specified mode or process of producing either stripes or fancy patterns, on or in cloth or fabrics of various kinds, the same consisting in the employment of one or more dye-vats, and a dyeing-frame, so constructed as to prevent the dyeing liquid from penetrating those portions of the cloth which we may not desire to color, and at the same time allow the coloring liquid to freely come in contact with the remainder, or those which it may be desirable to color; all substantially as specified.

"And, as auxiliary thereto, I claim the employment of the vertical frames, in connexion with the main dye-frame, in manner and for the purpose of protecting from contact with dyeing liquid those parts of the cloth which may be strained directly over against, or on, the ends of the horizontal strips of the main dye-frame, as set forth."

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18. For an *Improvement in Brick Presses*; John T. Brown and Moses Fuller, Midville, Burke county, Georgia, December 11.

Claim.—"What we claim as our invention, is the combination of the horizontal mould-wheel with the mechanical discharger and endless conveyor, in the manner and for the purpose set forth."

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19. For an *Improvement in Apparatus for Bending Hames*; Abel Gardner, Buffalo, New York, December 11.

Claim.—"What I claim as my invention, is the process of bending hames, by means of the combination of the hook-piece and the iron strap made fast at the ends, in the manner and for the purpose set forth."

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20. For an *Improvement in Machinery for Turning Clothes Pins*; Asa Greenwood, Marlboro', Cheshire county, New Hampshire, December 11.

Claim.—"What I claim as my invention, is the rotary mandril, the cutter for reducing the stick to a cylindrical shape, the cutter for forming the body of the pin, the cutter or cutters for forming the head, the centre rod, its fork and pattern lever; the whole being applied to carriages, and made to operate together substantially in manner and for the purpose as specified."

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21. For a *Double Bolt Trick Lock*; Lewis M. Hartley, Kensington, Philadelphia county, Pennsylvania, December 11.

The patentee says,—"The nature of this invention consists in arranging in the case of the lock two pair of bolts, one above and the other below the keyhole, the plates of those nearest the keyhole being notched on their edges, to receive the fingers of the key and pins projecting from the tumblers, and the plates of their mates being provided with pins, extending downward and entering slots formed in traversing plates arranged below the tumblers and guard, and operated on by the lower finger of the key, in such a manner as to allow of the bolts and plates nearest the keyhole to be moved by inserting the key partly in the lock, and turning the same half-way round above the guard, whilst the others are prevented from moving at all, except by forcing the key to the full depth in the lock, after making the half revolution named, and turning it back to its first position, causing the bolts first moved to be drawn into the lock, and their mates to be thrown out, when the key can be drawn slightly out, so as to bring its fingers above the guard, and again turned so as to throw the bolts nearest the keyhole out, without affecting the others, thus making it impossible to move the bolts farthest from the keyhole, except through the agency of the other two; and also in providing the lock with other safety guards hereinafter mentioned."

Claim.—"What I claim as my invention, is the combination and arrangement of the twin bolts, (any number being arranged in the same case,) tumblers having pins at their ends which enter corresponding notches in the bolts, traversing slotted plates, pins on the bolts, entering the slots of said plates, substantially as herein set forth; the bolts nearest the keyhole being required to be thrown out and in before the other bolts can be thrown out, and *vice versa*, as described."

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22. For an *Improvement in Packing Pump Pistons*; Edwin A. Jeffery, Corning, Steuben county, New York, December 11.

The patentee says,—"My invention consists in so constructing the pistons of pumps that

a quantity of water shall always intervene between their interior surface and the external air, being, in fact, the substitution of water to pack the piston, for metal gasket, leather, and other substances heretofore employed for that purpose."

Claim.—"What I claim as my invention, is the pump piston constructed essentially of two disks and a valve, substantially as herein set forth, whereby it is rendered capable of keeping itself packed with water."

23. For an *Improvement in the Mode of Changing the Gearing of Drawing Heads while in motion*; Alfred Jenks, Bridesburg, Philadelphia county, Pennsylvania, December 11.

The patentee says,—“In drawing heads, it is essential that the speed of the drawing rolls should vary with the quantity of cotton fed to them, in order that the sliver produced may be always of uniform size; and my invention consists in giving a triangular cross section to the key-seats of a cone of differential cog wheels, through which the constant speed of the prime mover is transmitted to the rolls, and in attaching a sliding key of a corresponding cross section to a spring bar, which is received in a groove extending lengthwise in the surface of the spindle on which the cog wheels are mounted; the spring bar extends beyond the end of the spindle, and is moved by hand from the key-seat of one wheel to that of another, when it is necessary to change the speed of the drawing rolls.”

Claim.—"What I claim as my invention, is a sliding spring key, arranged and operated substantially as herein set forth, for connecting any one of a series of wheels with a common spindle, and for disconnecting it therefrom, at will."

24. For an *Improvement in Looms for Weaving Figured Fabrics*; Moses Marshall, Lowell, Massachusetts, December 11.

The patentee says,—“The elementary features of my improvements consist in a series of stationary rests which support the jacks of the harness, when sheds operated by them are not in use; the chain shafts and lifting and depressing bars, for operating the jacks and harness; and the evener, as I term it, which is composed of two rollers, set in a frame having a reciprocating rectilinear motion, which rollers press against the beveled ends of the harness, and assist in shifting the sheds of yarn, and, what is more essential, operate always to keep the levers even; for the proper operation of the cams on the pattern chain.”

Claim.—"What I claim as my invention, is the improvement herein above described in the machinery for operating the harness, so that any proper number of heddles may be used or changed, as desired, without taking the loom to pieces; said improvement consisting, first, in providing the movable spring rests for supporting the jacks of the harness when they are not in use, and which are sprung back by the bevel face on the shoulders of the jacks, when they are kept in play by the cams on the pattern chain, the whole arrangement being substantially as herein above set forth; and second, in the 'evener,' constructed and operated as herein described, for assisting in moving the upper heddle levers and keeping them even, so that the cams or rollers on the pattern chain will operate accurately on the jacks, as specified;—meaning to claim the exclusive use of said spring rests and evener in a loom, the invention of which is entirely original with me.

“I also claim the combination of rotating lifting and depressing bars, arranged in endless chains, so as to revolve as described, with the forked jacks having internal shoulders, as described.”

25. For an *Improvement in Bedstead Fastenings*; John Moulton, Ossipee, Carrol county, New Hampshire, December 11.

Claim.—"What I claim as my invention in the fastening, is the use of several projections, as set forth, combined with the recesses cut into the sides of the mortise, substantially in the manner and for the purposes set forth."

26. For *Improvements in Machinery for Preparing Hubs for Boxes*; Isaac Mundén, Allegheny City, Pennsylvania, December 11.

The patentee says,—“The nature of my invention consists of a combination of adjusting clamps or jaws with a mandril, for the purpose of centring the mandril perfectly, and holding a carriage or wagon hub firmly while being bored; the application to the mandril of a screw with a thread of the square and V-form, working in a segmental hinge nut, for the purpose of preventing the mandril from going downwards too fast while boring, and yet at the same time allowing the operator to raise and lower it at pleasure; a peculiar mode of

forming the cutting tool for boring, and fastening it to the mandril to keep it tight; and also an arrangement for screwing and unscrewing the cutting tool without using a wrench; which several parts, together with other subordinate and operating parts connected therewith, constitute a boxing machine for boring out the inside of wagon and carriage hubs with great despatch, precision, and regularity."

Claim.—"What I claim is, 1st, the hinged jaws constructed and arranged in the manner described, and operated as set forth, for centreing the mandril to bore wagon or carriage hubs.

"2d, I claim the hinged segmental nut, constructed as described, in combination with the mandril which has a square and inclined thread cut upon it, to coincide with a thread of the same form cut on the inside of the said nut, to prevent the mandril from feeding down too fast in the act of boring, and also to allow the mandril to be moved up or down at pleasure, in the manner substantially as herein described.

"3d, I claim the mode of fastening the cutter to the mandril, by passing it through the slot or eye of the nut or cutter-box, formed with an interior thread to fit on to the screw-pin of the mandril, whereby, by screwing on the nut, the end of the mandril is made to retain the cutter firmly in the proper position for boring. In connexion with this arrangement for setting and securing the cutting tool, I claim the cutter-box formed with the projection, whereby, by raising it (the box) until it comes in contact with the shoulders formed by the braces, the cutter can be screwed and unscrewed without a wrench, as herein fully set forth."

27. For an *Improvement in Machinery for Making Cord*; William E. Nichols, East Had-dam, Middlesex county, Connecticut, December 11.

The patentee says,—"My invention relates to the manner in which the bobbin frames are turned on their own axes, to twist the yarns from the bobbins which they respectively carry into strands, while at the same time they are carried around a common centre to twist the strands into a cord; the manner in which the relative amount of twist given to the cord, and the individual strands of which it is composed, can be varied at will; the manner of laying the yarns of the strand; and the construction of the compressing tube for smoothing and condensing the cord after it is laid."

Claim.—"What I claim as my invention, is, 1st, revolving the bobbin frames on their own axes to twist the strands, at the same time that they are carried round a common centre to twist the cord, by rolling them on the surface of a stationary annular inclined track, towards the inner or outer periphery of which they can be adjusted to run; so as to vary the relative twist of the strands and cord, substantially as herein set forth.

"2d, I claim the construction and arrangement of the central stem or spindle of the bobbin frame, operating substantially as herein set forth, whereby the yarns are collectively subjected to progressively increasing tension and twist from the commencement to the end of the process of laying them into the strand, whereby the latter is rendered smooth and regular in its figure, and of uniform strength and density, and subjected to uniform tension while being laid into the cord."

28. For an *Improvement in Making Tin Boilers for Cooking Stoves, with Cast Iron Bottoms*; Gibson North, Philadelphia, Pennsylvania, December 11.

The patentee says,—"The nature of my invention consists in the union of a tin top to a cast iron bottom, so coated as to prevent rusting, and to be both more durable and more economical than bottoms of tin or copper."

Claim.—"What I claim, is my improvement in the manufacture of boilers for cooking stoves, as above set forth: that is, making the bottoms of cast iron and the bodies of tin, the two being soldered together substantially as described."

29. For an *Improvement in Bedstead Fastenings*; J. Parsons Owen, Norwalk, Huron county, Ohio, December 11.

Claim.—"What I claim as new, is a bedstead fastening consisting of a box formed of two parts, having screw-threads therein, and divided through the centre longitudinally in the plane of the axis of said screws, as described; said parts being so formed by locks as, when inserted into a bedpost, to have both parts firmly held in place against the force of the screw."

30. For an *Improvement in Faucet-Breech Guns*; Alonzo D. Perry, City of New York, December 11.

The patentee says,—"My invention relates to the class of fire arms in which the charge is

introduced at the breech, into a vibrating cylinder which receives the charge in one position, and then, by turning a part of a revolution, brings said charge on a line with the bore of the barrel, and into position to be discharged.

"The first part of my invention consists in having a vibrating breech, which is enclosed in a chamber, on journals, that its periphery may turn freely in the chamber. And this part of my invention also consists in combining with the above mode of hanging the vibrating breech in a chamber, the making of a groove or grooves in the inner periphery of the chamber around the bore of the barrel, and extending out at the side or sides, for the free escape of the gases and smoke from the discharge, to prevent the accumulation of the deposits of smoke on the periphery of the breech and chamber, thus preventing all clogging or danger of fire being driven back into the charger.

"The second part of my invention consists in combining with a vibrating breech a charge-holder, for containing a series of cartridges or charges, and located in the breech of the stock, so that by vibrating the breech, its mouth can be presented to the charge-holder to receive the cartridge, and then turned back to bring it in a line with the bore of the barrel for the discharge, the turning of the barrel cutting off all communication with the charge holder; and this part of my invention also consists in combining with the charge-holder and vibrating breech a transferring lever, which takes the cartridge from the charge-holder and transfers it into the breech, the position of the charge-holder, relatively to the vibrating breech, is such that, in the act of discharging the gun, the recoil tends to close the opening into the charge-holder, and thereby prevent any fire being thrown back into the charge-holder or magazine, and secures them from danger of explosion."

Claim.—"What I claim as my invention, is, in combination with a vibrating breech, turning within a chamber, the making of a groove or grooves in the inner periphery of the chamber, and extending out at the side or sides thereof, for the purpose and in the manner substantially as herein described. I also claim the revolving charge-holder located in the breech of the stock, substantially in the manner and for the purpose specified. And finally, I claim the combination of the levers, by means of which one charge only is permitted to fall forward at a time when the muzzle of the gun is depressed, and by which it is forced home into the vibrating breech, as described."

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31. For an *Improved Apparatus for Drawing Water from Wells*; Harvey W. Sabin, Reed's Corners, Ontario county, New York, December 11.

Claim.—"What I claim as my invention, is the mounting of the respective parts of the drawing apparatus upon the rotating disk, when the said disk is placed upon, and supported by, the circular platform, which has the grooves formed in its face, and the notched ears rising from its periphery, that are combined and operate with the drawing apparatus, substantially in the manner and for the purpose as described."

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32. For *Improvements in Self-Acting Car Couplings*; Albert G. Safford, Boston, Massachusetts, December 11.

Claim.—"What I claim as my invention, is the revolving series of arms, and the link constructed with an opening or cross bar at one end, or each of its ends, in combination with the box and pawl, all substantially as specified."

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33. For an *Improvement in Machinery for Jointing Staves*; David Vaughan, Remsen, Oneida county, New York, December 11.

The patentee says,—"The nature of my invention consists in providing a shaving cutter on a slide, which has a depression at the middle where the shaving tool is secured, to shave the one-half of the taper on the edge of the stave, from the bilge to the end, by the shaving tool cutting in one direction, and to shave the other taper from the bilge to the end of the stave in the opposite direction.

"My invention furthermore consists in providing side guide rails, with a depression in the middle of them, to correspond with the depression in the middle of the jointer slide, and this depression and the side rails to be employed in combination with the slide and clamps, or a clamp to guide the stave to the action of the shaving knife, to shave the edge of the staves at an angle, to produce any edge taper on the stave for casks or barrels of different diameters.

"My invention further consists in providing a clamp with a movable jaw, to secure the stave between it and the stationary jaw, the said jaw being opened and closed by pushing it backwards and forwards against the side pressure of stationary pins, to exert a great power to retain crooked staves, and an easy plan to take out and put in the stave."

Claim.—"I claim the plane-stock of the jointer, formed with a depression in the middle, for the purpose of guiding the shaving plane, to shave the exact taper on the stave, from the bilge on the middle to the end of the stave, in the manner herein described, in combination with the mode of producing a traverse taper or feather of any angle on the edge of the stave, according to the diameter of the cask or barrel, by the stave being held to the action of the shaving knife, by the combination of the plane-stock and the clamp with the guide rail, in the manner herein described."

34. For an *Improved Machine for Grinding or Polishing Tools*; Joseph Vaughan, Jr., Union, Lincoln county, Maine, December 11.

The patentee says,—"The nature of my invention consists in a machine so constructed and arranged as to hold an axe or other implement on a polishing wheel, and give it the motion required to bring every part of the surface required to be polished in contact with the polisher, in such a manner as to give every part a sufficient and uniform polish, and by means of which one man or boy may tend the polishing of a number of axes or other implements at the same time, making a great saving of labor."

Claim.—"What I claim as my invention, is the following, to wit:—1st, That part of the above described machinery by which an axe or other implement to be polished receives a reciprocating motion, and by which that motion is regulated, in combination with that part of the machinery by which it is made to cant or rotate at the same time, sufficiently to present all part of the surface to be polished to the polishing wheel.

"2d, The machinery described for holding and giving motion to the axe or other implement while being polished, in combination with the polishing wheel, moved and kept in motion in the manner described."

35. For *Improvements in Operating the Hammers of Spike Machines*; Harry A. Wills, Keeseville, Essex county, New York, December 11.

The patentee says,—"My invention consists in drawing out the point of the spike by a set of hammers which act on the four sides of the rod, they being so arranged that they are drawn forwards along the point between the blows, and at the same time made to strike closer together. The machine is so constructed that the fibre of the steel, of which the knives, dies, header, &c., are made, is opposed endwise to the pressure."

Claim.—"What I claim as my invention, is, 1st, the combination of advancing and receding hammers with their respective adjustable wipers and hinged drags, arranged and operating substantially as herein set forth.

"2d, I claim the adjustable wipers, which can be set to cause the hammers to form spike points more or less sharp.

"3d, I claim drawing the pointing hammers of a spike or nail machine along the rod, substantially in the manner herein set forth, during the operation of forming the point."

36. For an *Improvement in Bending Wood*; Thomas Blanchard, Boston, Massachusetts, December 18.

Claim.—"What I claim, is my method of bending fibrous materials by means of the upsetting movements, or the upsetting and relaxing movements combined, as exemplified in the screw H, whether such movement or movements be produced by means of the screw, wedge, comb, lever, rack and pinions, or any other equivalent means."

37. For an *Improvement in Bran Dusters*; Robert M. Dempsey, Indianapolis, Marion county, Indiana, December 18.

Claim.—"What I claim as my invention, is constructing the rotary scourer and separator with concentric roughened and reticulated prismatic rings, and hanging roughened or toothed prismatic rings, the latter being placed in the spaces between the former, so as to leave concentric spaces between their inclined surfaces, for the passage of the bran and flour over and around the ridges and sides of the aforesaid several prismatic rings, in the manner and for the purpose set forth, by which the flour adhering to the bran, after leaving the ordinary bolts, is completely separated therefrom and saved, to be mixed with the superfine flour, or for any other purpose which the miller may desire; the flour passing through the wire bolting screens, and out of the curb or case, through the spout S, whilst the bran is forced to the upper part of the curb, and out of the spout R, by the centrifugal action of the separator, aided by the blast of wind created by the rapid rotary motion of the said scourer and separator, as set forth."

38. For an *Improvement in the Manufacture of Buttons*; W. R. Hitchcock & Co., assignees
Peter Kirkham, Waterbury, New Haven county, Connecticut, December 18.

The patentee says,—“The nature of my invention consists in substituting wooden moulds for the common stuffed metallic shell, and combining the said mould or moulds with the ring or collet, in such a manner as to secure the shank and covering of the button inside between the wooden mould and the collet or ring.”

Claim.—“I claim the new and useful improvement in the manufacture of buttons of substituting a wooden mould for the common metallic shell that is stuffed with paper, and using the said wooden mould either for the top or bottom of the button, and covering the button entirely, or only part of it, with some textile fabric or substance, and securing the shank and the covering inside between the wooden mould and ring or collet of the button, in the manner herein described.”

39. For an *Improvement in Clover Harvesters*; Samuel Krauser, Reading, Berks county, Pennsylvania, December 18.

The patentee says,—“My invention consists in giving to the teeth an improved form, and making the stock to which they are attached adjustable, so as to carry them at different heights from the ground, to adapt them to stripping the seed off clover plants of different heights, combining with the teeth a transverse knife, attached to, or passing through, their rear ends, and so arranging the teeth that, at whatever height they may be placed above the ground, the angle they make therewith will be very nearly the same.”

Claim.—“What I claim as my invention, is maintaining the series of teeth at nearly the same angle with the ground, at all heights to which they may be adjusted therefrom, in the manner herein set forth.

“I also claim forming the fingers with a depression on their upper side above the knife, substantially in the manner and for the purpose set forth.”

40. For an *Improved Alarm for Indicating Want of Water in Boilers*; Azel S. Lyman, Upper Alton, Madison county, Illinois, December 18.

The patentee says,—“The nature of my invention consists in the combination of the air-gauge or mercurial tube with a metallic vessel, filled with water, secured to the flue of the boiler, or other part which will receive extra heat whenever the water falls too low; said vessel also being connected by a metallic tube to an elastic valve, which, when the heat is greater in the vessel secured to the flue, (which will only occur when the water is low,) will raise the mercury in the water-gauge, and also the lever of the elastic valve; this lever at the same time raises the steam valve of the gauge, and operates a steam whistle to give warning.”

Claim.—“I claim the introduction of the tube or box on the flue, or other surface exposed to extra heat when water is too low, filled with water or other suitable liquid, for the purposes set forth.”

41. For a *Combined Lap and Butt-Welded Tube*; James McCarty, Reading, Berks county, Pennsylvania, December 18.

Claim.—“What I claim, is a pipe composed of a combination of the butt-weld with lap-welded ends, as set forth.”

42. For *Improvements in Folding Gates*; Isaac Meritt, North West Bridgewater, Plymouth county, Massachusetts, December 18.

The patentee says,—“The nature of my invention consists in the novel application of the well-known principle of construction called the ‘lazy tongs,’ in combination with a railway, wheels, recessed receiving posts, and vertical parallel guide posts, by which I produce a curious and beautiful expanding and contracting gate of small pieces of timber, or bars of iron, either single or double, which may be moved partially or wholly over a horizontal railway to any degree required, by the application of very little power.”

Claim.—“What I claim as my invention, is a single or double gate, constructed substantially as herein above described, so as to fold up horizontally in opening the same, by degrees, according to the width of the opening required, without the necessity of moving the whole structure, as when it swings on hinges horizontally in the arc of a circle, or vertically on a horizontal bolt or pin, when folding in the manner of a parallel ruler; my said improved gate moving horizontally over rails on wheels, with great ease, whilst being contracted or expanded in opening or closing the gate, as set forth.”

43. For an *Improvement in the Manufacture of Flax and Hemp*; Robert Patterson, New Hartford, Oneida county, New York, December 18.

The patentee says,—“The nature of my invention consists in treating what is called the lap with an alkaline solution, then washing it in water, and afterwards drawing it in a wet state in the common cotton drawing frame, upon the same principle as drawing cotton, in order to draw a finer thread from the lap than can be done by the common dry process of drawing, and to prevent the making of so much tow as is now made by the common process.”

Claim.—“What I claim as new, is the following process for preparing hemp and flax for spinning, viz., the treating of the lap, after it comes from the spreading frame, with an alkaline solution to soften the gluten of the flax, and washing it afterwards, as has been described, as a preparatory process for drawing it in the common drawing frame, and drawing the flax lap in the common drawing frame, while the said flax lap is in a wet state, to draw out and separate the finer from the coarser fibres, and reducing the flax to its greatest possible fineness, making less tow, and running the machinery at a greater speed than by the dry process, and dispensing with the hetchell gill frame, substantially as set forth.”

44. For an *Improvement in Signal Lanterns*; Hugh Sangster, Buffalo, New York, December 18.

Claim.—“What I claim as my invention, is subdividing the front of the lantern into three divisions or sectors, and arranging and operating the colored glasses enclosed therein, in the manner described.”

45. For an *Improved Method of Revolving the Hammer of Repeating Fire Arms*; Christian Sharps, City of Washington, D. C., December 18.

The patentee says,—“My invention consists in attaching to a revolving hammer a double-faced ratchet, which is acted upon by two levers, which together turn the hammer the angular distance required to discharge the barrels consecutively.”

Claim.—“What I claim as my invention, is the combination of the cocking and spring levers with the double ratchet wheel on the revolving hammer, substantially in the manner set forth.”

46. For an *Improvement in Churn Dashers*; Henry Stanton, Richfield, Otsego county, New York, December 18.

The patentee says,—“The nature of my invention consists in a peculiar construction of a spiral float for churning and gathering the butter, combined with an air tube or arm, placed in such position as to form a vacuum when turned with a slow motion, said arm being made in the form of a wedge, and provided with a valve to prevent the butter getting in the tube whilst gathering the butter; likewise to prevent the cream getting into the said hollow arm whilst the churn is not in action. Also in constructing the top of the hollow shaft of the spiral float funnel-shaped, for pouring an alkali, for disseminating it more evenly through the cream. Likewise in combining with the churn a heater and cooler, which is made movable, so as to be taken out and put in at pleasure, for keeping the cream at the required temperature, using heated or congealed water in the heater and cooler, for raising and lowering the temperature of the cream to be churned.”

Claim.—“What I claim as my invention, is the combination of the perforated spiral float with the prismatic radial arm and vertical shaft, arranged and operating in the manner and for the purpose herein set forth.”

47. For an *Improved Valve-Motion, Cut-Off, and Steam-Stops for Rotary Engines*; Henry G. Thompson, City of New York, December 18.

Claim.—“What I claim as my invention, is, 1st, the method of operating the steam-stops or abutments, by a crank-motion derived from the rotation of the piston-wheel, substantially as described, when this is combined with the rotating piston-wheel, the form of the periphery of which is such as would be generated by its rotation and the motions of the steam-stops, substantially as described, that the steam-stops may always, in their motions, be in contact with the periphery of the piston-wheel, and not operated by such periphery, as described.

“2d, I claim making the ends of the steam-stops with projections or toes, that embrace the sides of the piston-wheel, and extend within the periphery thereof, substantially as described, when this is combined with the grooves or recesses in the packing ring, or any equivalent substitute therefor, substantially as described, whereby the steam is prevented from passing

from one side to the other of the pistons, through the grooves or recesses in which the ends of the stops slide, as described. And,

"3d, I also claim, in combination with the herein described method of operating the steam-stops, the employment of cut-off valves, operated by eccentrics, or their equivalents, on the crank-arbors that operate the steam-stops, substantially as described."

48. For an *Improvement in Bottle Fasteners*; Isaac Winslow, Philadelphia, Pennsylvania, December 18.

Claim.—What I claim as my invention, is the combination of the metallic caps with the tube, constructed and used in the manner and for the purpose set forth."

49. For an *Improved Concealed Hammer and Turning Nipple Lock*; Andrew Wurfflein, Philadelphia, Pennsylvania, December 18.

The patentee says,—“The nature of my invention consists in so constructing the lock that the percussion cap, or other primer used to explode the charge, is entirely protected from the weather, concealed from view, and, when exploded, does not cause a volume of smoke to rise above the lock, nor any particles of the primer to escape from the chamber at the moment of discharging the piece;—accidental or premature discharges being prevented by securing the trigger by a spring catch; the priming being effected by placing the cap upon the nipple with the thumb and finger when exposed; said nipple being screwed into a swing lever affixed to the lock-plate by a fulcrum pin, and made to turn or swing horizontally in the arc of a circle, to expose the nipple to receive the primer from the outside, and conveying it inside of the cap or priming chamber; the hammer being cocked simultaneously with the operation of turning the nipple; the trigger being secured from turning until required to act on the seer, by the said spring catch, which is disengaged from the trigger in the act of grasping the piece to discharge the same, and the lock being entirely concealed is not liable to be broken, or to be in the way when used by horsemen or otherwise, and the trigger being locked is not liable to discharge the lock, by being struck by any article, or by a sudden jar of the gun against anything.”

Claim.—“What I claim as my invention, is the combination of the lever with the nipple attached thereto, and sliding hammer, arranged and operated substantially as set forth, by which the nipple is turned and exposed to receive the percussion cap, and the hammer cocked simultaneously by the movement of the lever; the cap being exploded within a chamber inside the stock in a peculiar manner, as set forth, by which the inconvenience arising from flying fragments of the exploded cap, and from smoke, at the moment of discharge, are avoided.”

50. For an *Improvement in Machinery for Dressing Staves*; Asa Broad, Louisville, Kentucky, December 18.

The patentee says,—“The nature of my invention consists in the combination of the several parts of my machine with each other, in such a manner that a shingle will be smoothly dressed on its under side and split from the block at one movement of the carriage; which shingle will fall upon a platform, and be dressed and beveled upon its upper side, during the return movement of the carriage.”

Claim.—“What I claim as my invention, is the tilting plate, placed in front of the forward cutter, in the head, in combination with the pin projecting from the beam of the supporting frame, for the purpose of throwing the shavings clear of the cutters, substantially in the manner herein set forth.”

51. For an *Improved Lock for Fire Arms*; Orison Blunt, City of New York, December 25.

Claim.—“What I claim as new, is the mode described of forming the seer as a lateral spring, with a bevel on the part next the tumbler, and the mode of forming the projection on the tumbler with a similar bevel, so that these two parts operate together to discharge the fire arm, by the direct pull of the trigger, and place the parts in a situation to effect a second or successive discharges, by the reverse motion of the trigger; the whole of these movements and effects being produced by the seer and tumbler, without any intervening parts, substantially in the manner described.”

52. For an *Improvement in Drawing Boards*; Henry W. Chamberlain, Pittsfield, Berkshire county, Massachusetts, December 25.

The patentee says,—“The nature of this invention consists in a peculiar mode of securing

to the upper surface of a drawing board, by means of fingers and parts attached to the same, the sheet of paper upon which the figure to be plotted is designed to be delineated."

Claim.—"What I claim as my invention, is the combination of the pointed right angled plates, bars moving over the pins forming the legs on which the board rests, spiral springs, and rod or bale of the form of an ellipsis, for clamping and unclamping the paper as described."

53. For an *Improvement in Flutes*; Charles G. Christman, City of New York, December 25.

The patentee says,—"My invention consists in certain improvements in the musical instrument called the flute, whereby certain notes are produced which are wholly unknown in the old instrument; and secondly, the improvement in the quality, power, and significance of certain other notes, which, although produced on common flutes, are yet of a very defective and unsatisfactory character."

Claim.—"What I claim as my invention, is, 1st, removing the third and sixth holes from their ordinary place on the old flute to a point farther down, and sounding the notes produced by the said holes by keys operated at the natural fingering place, thereby producing with ease a quality of tone now unattainable, or attained only by great skill, and then with uncertainty."

"2d, I claim producing the true sharp and flat keys by means of the double holes and operating keys, as described."

54. For an *Improved Process for Making Thin Iron Castings*; Henry Bleecker, William E. Bleecker, and Samuel D. Vose, Albany, New York, December 25.

The patentees say,—"The nature of our invention consists in the manner of using a combined mould in repetition, for the purpose of casting light cast iron plates."

Claim.—"What we claim as our invention, is the process of making thin or light castings of iron, by pouring the metal into a mould of iron that surrounds the article to be cast, entirely with the exception of the gates; said mould being previously smoked on the inside, and provided with a case or knapsack which contains a non-conducting material; the whole process being conducted substantially in the manner and for the purposes set forth."

55. For an *Improved Earth Borer and Elevator*; Phinehas Dow, Philadelphia, Pennsylvania, December 25.

Claim.—"What I claim as new, is the combination of the auger and the circular plate, fixed upon the same shaft, with the cylinder which does not revolve with the shaft, and may be moved along with it, by which I dispense with the force necessary to turn the cylinder, and empty out the excavated material in an easier manner than has heretofore been practised."

56. For an *Improvement in Cast Iron Car Wheels*; Carmi Hart, City of New York, December 25.

Claim.—"What I claim as my invention and discovery, is the form of the car wheel made with the multiplied and reversed or alternate corrugations of the plates or flanches, as specified; and also the combination of the said plates or flanches with the said spokes, so corrugated or bent, as set forth and described, so as, all together, to prevent straining or cracking of the metal by contraction in cooling, and giving thereby, and by the said combination, greater strength and durability to the cast iron car wheel than has before been attained."

57. For an *Improvement in Bedsteads*; Benjamin Hinkley, Troy, New York, December 25.

Claim.—"What I claim as my invention, is the union of the side and end rails of a bedstead into a frame entirely independent of the posts, substantially in the manner and for the purpose as set forth."

58. For *Improvements in Breech-Loading Fire Arms*; George A. Arrowsmith, assignee of Lewis Jennings, City of New York, December 25.

The patentee says,—"My invention relates to that class of fire arms in which loaded balls are used and inserted in a tubular magazine below, and parallel with the barrel, although some of my improvements may be employed without such balls; and my invention consists, 1st, in the employment of a sliding charger, which slides in the tube magazine to force down the loaded balls or cartridges, and operated by a sliding ratchet-rod connected with the bar

of a sliding trigger, the teeth of the said ratchet-rod, as it is drawn back, taking hold of a jointed catch on the charger to draw it down, and with it the charges in the magazine, and, on the back motion, pass by the catch; the charger, during this back motion of the ratchet-rod, being retained by another catch which takes into the teeth of a permanent ratchet lying by the side of the sliding ratchet.

"2d, In making the charger in two parts, one sliding within the other, and the two connected together by a spring, the catch of which is acted upon by the sliding ratchet, being jointed to the inner part and passing through a slot made through the outer part. By this means any difficulty arising from irregularities in the motion of the sliding ratchet, or in the length of the balls, will be avoided, for, as the charger is drawn down, the spring which connects the two parts will be contracted, and the tension of the spring will continue to make pressure on the series of charges, to insure the transfer at the proper time.

"3d, In employing a carrier in the breech of the gun, in combination with the magazine that contains the charges, the said carrier being adapted to receive a charge at each operation, to transfer it at the proper time to the breech of the barrel; and also in combining therewith a sliding breech-pin, which forces the charge from the carrier into the breech of the barrel, and there retains it for the discharge, the said sliding breech-pin being in turn combined with a jointed stop or abutting lever, which, so soon as the sliding breech-pin is forced up to its place in the barrel, is carried up behind the said breech-pin, to constitute an abutment to resist the force of the discharge, and prevent the breech-pin from being forced back.

"4th, In combining with the magazine, and the carrier that elevates or transfers the charge from the magazine to the breech of the barrel, a jointed stop, which, by the motion of the carrier, is thrown across the rear aperture of the magazine, to prevent the delivery of the charges during the time that the carrier is elevated.

"5th, In combining with the receiving chamber, and the carrier that elevates the charge or cartridge, a curved lever jointed to the side of the chamber, with the two ends either curved inwards or provided with projections, so that when the rear end of the charge acts on the curve or projection at the rear end, it shall cause the curve or projection at the forward end to hug the curve of the forward end of the ball or cartridge, to hold it steadily in place until elevated by the carrier.

"6th, In combining with the carrier a catch spring, with a thumb piece that projects beyond the breech-plate, for the purpose of holding down the carrier during the operation of cocking, so that in the event of a non-discharge of the gun, the lock and the parts connected therewith may be operated to discharge the gun without elevating another charge.

"7th, In the use of a spur on the spindle of the cock, when combined with a catch spring on the movable breech-pin, so that by the act of cocking, the spur shall act on the spring catch, to give the breech-pin so much of a back motion as simply to relieve it from the breech of the barrel, that the remaining back motion may be given to it by the trigger-bar, which is thus relieved of the great strain required to liberate or start the breech-pin."

Claim.—"What I claim as my invention, is, in combination with a magazine for containing the cartridges or loaded balls, and which communicates with the barrel, the employment of a sliding charger operated substantially as herein described, for the purpose of forcing the cartridges, as they are required, towards the rear end of the magazine, as described.

"2d, I claim making the charger in two parts, connected by a spring, and working substantially as herein described, whereby any difficulty arising from irregular working or yielding of the parts will be avoided, and by which also the transfer of the cartridges or charges to the carrier is insured.

"3d, I claim combining the carrier, the breech-pin, and the abutting or stop-lever, with the sliding trigger-bar, substantially as herein described, whereby all the movements of all these parts are effected by the motions of the trigger-bar, as described.

"4th, I claim the longitudinal fillet on the trigger-bar, in combination with the pinion having one cog grooved for the passage of the said fillet, substantially as described, by means of which the pinion is made to retain the sliding breech-pin in place while the trigger completes its motion to discharge the piece, and to elevate the stop or abutting lever, as described.

"5th, I claim the stop which prevents the passage of the cartridges from the magazine, when this is combined with the carrier and magazine, substantially as described.

"6th, I claim, in combination, with the receiving chamber and carrier, the lever which hugs and steadies the cartridge or ball therein, substantially as described.

"7th, I claim, in combination with the carrier that elevates and transfers the cartridges or charges, the spring catch, by means of which the carrier can be held down, to permit the piece to be re-cocked without transferring a charge to the barrel, substantially as described.

"And finally, I claim the spur on the spindle of the cock, in combination with the catch on the sliding breech-pin, substantially as described, by means of which the pull on the cock has the effect to withdraw the breech-pin from the breech of the barrel, as described."

59. For a *Tubular Packing for Pistons and Stuffing Boxes*; William Crofton Moat, London, England, December 25; anté dated January 4, 1849.

Claim.—"What I claim as my invention, is the employment of yielding hollow rings and yielding tubing, (of whatever material the same may be composed,) filled with air or gas more or less compressed, for the better packing of the pistons and stuffing boxes of engines worked by steam, air, or gas, as described."

60. For an *Improvement in Railroad Trucks*; J. W. Moyer, Utica, New York, December 25.

Claim.—"What I claim as new, is the combination of the friction wheels and truck wheels with the truck frame, substantially as described, in which I employ sliding boxes, and connect the parts with springs, while at the same time the axles are made to work steadily in union, and produce the desired effect in a perfect manner."

61. For an *Improvement in Seed Planters*; Jacob Peirson, Wilmington, New Castle county, Delaware, December 25.

Claim.—"What I claim as my invention, is the peculiar construction of the short axles, as described, in combination with the drilling and seeding machine; said machine containing an intermediate wheel for gearing and ungearing the seed rollers with the cart or driving wheels; said machine also containing a device for simultaneously elevating and dropping all the tubular drills, and likewise containing separate lifting and suspending hook-rods, for raising or suspending one or all of the tubular drills at the same time."

62. For *Improvements in Wheels for Carriages*; Isaac B. Ward, Camden, Camden county, New Jersey, December 25.

Claim.—"What I claim as my invention, is the manner of employing the screw-bolts between the ends of the cast iron felloes, of the peculiar construction set forth, in combination with said felloes and the ordinary circular wrought iron tire, in the formation of carriage wheels for common roads."

63. For an *Improvement in Portable Lanterns*; Nathaniel Waterman, Boston, Massachusetts, December 25.

Claim.—"What I claim as my invention, is the lantern constructed with a closed flame chamber, having glass or transparent sides, in combination with an open supplying and chimney tube, extending down through the top of the lantern, and the cap-plate or disk; the whole either with or without the upper frustum, and applied together and made to operate substantially as specified.

"I make no claim to the use of a reflector in a lantern, as it is ordinarily used, but what I do claim is the combination of the reflector, the lamp, the closed flame chamber, and the chimney over the flame, the same being as specified, in order that the external downward or supplying current of air shall so encircle the upward current of smoke and hot air proceeding from the flame, as to prevent it in a great measure from smoking or soiling the reflector, and thereby cause it to improperly distribute the light which emanates from the flame."

64. For *Improvements in Machinery for Boring Window Blinds*; John Wiley, New Orleans, Louisiana, December 25.

The patentee says,—"The nature of this invention and improvement consists in arranging within a suitable frame a horizontal frame susceptible of being raised and lowered, and containing a pair of revolving traversing drills, in which the bits or other instruments for boring are inserted, and arranging on either side of the same a sliding frame, by which the frames and slats of the blind are moved past the bits or other implements, provided with gauges capable of being altered to correspond with the required distances between the openings to be bored, in such a manner as to bore said openings with accuracy, without the usual measurement, and with a slight expense of power."

Claim.—"What I claim as my invention, is the combination of the graduating frame, spring stops or palls, bent levers attached to the rib by chains or cords, with the sliding frame to which the frame or slat to be bored or mortised is secured, as described.

"I also claim the combination of the traversing arms, projecting from the slides moving in the plates, and provided with the clamp screws for securing the ends of the frames, with the

hollow traversing boxes, provided with clamp screws and springs, and spring rollers, for steadying the frame in its passage, as herein set forth.

"I likewise claim the combination of the elliptical cams secured to the upright shafts, having cog wheels on their upper ends, with the pulleys, in the manner and for the purpose set forth."

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65. For an *Improvement in Apparatus and Process of Rotting Hemp and other fibrous materials*; Lemuel W. Wright, Plainfield, New Hampshire, December 25.

The patentee says,—“The nature of my invention is to treat hemp, flax, China grass, and other vegetable fibrous substances, in such a manner as will more perfectly separate the fibres of such materials for manufacturing them into yarns than has hitherto been done, and consists in macerating such materials in properly constructed vessels with alkaline solutions, at a high degree of temperature, and afterwards in cleaning and drying the material without previously handling it, whereby the fibres would become tangled and unfit for the uses intended.”

Claim.—“What I claim as my invention, is the treating of hemp, flax, and China grass, and other vegetable fibrous substances, in preparing them for spinning into fine yarns by steam, alkaline and saponaceous solutions, and drying the same by steam, as described, without handling the same during the process, thereby saving much labor and expense, as well as avoiding loss of material from tangling, matting, &c.

“2d, I claim the combination of the vessels, with their connecting pipes arranged so as to operate upon the hemp, &c., with the steam and solution, in the manner described, or such other arrangements as shall include substantially the same process.”

RE-ISSUES FOR DECEMBER, 1849.

1. For a *Mill for Rolling Irregular Shapes by means of a Cam Pattern*; John S. Hall, Columbus, Franklin county, Ohio; patented January 30, 1849, re-issued December 4.

The patentee says,—“The nature of my invention consists in connecting with the rollers of an ordinary rolling mill a cam-shaft, with cams thereon, to act upon the boxes in which one of the rollers turn, so as to cause it to rise and fall, to draw bars to any pattern by changing the relative size of the gearing, to make, on a small cam, a sufficient pattern for rolling a long bar, thus making a compact and variable machine by simply changing the gearing, or when the peculiar character of the pattern requires it, making the cam move faster, so as to reduce the pattern.”

Claim.—“What I claim as my invention, is the employment of cams, as herein described, for elevating or depressing one of the rollers of a rolling mill, in combination with gearing the same as above set forth, so that a pattern of any length on a cam may be made to affect the surface of any given length of bar in proportional ratio, by change of the relative size of the gearing, by which I avoid, in rolling long bars, any long patterns, difficult to handle and expensive to construct.”

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2. For an *Improvement in Fire Proof Safes*; Edward Hall and Joseph L. Hall, Cincinnati, Ohio; patented August 21, 1849, re-issued December 18.

Claim.—“What we claim as new, is joining the interior and exterior cases by the door frame, and connecting both cases with the insulating cement by means of the anchors embedded therein, substantially as herein set forth.

“We likewise claim the employment (in chests so joined) of hydraulic cement, as the insulating substance for fire proof safes or chests, it being stronger when concreted than other cements heretofore used for that purpose; thus making a safe of superior strength and durability, especially when the same is constructed in the manner described.”

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3. For an *Improvement in Harvesting Machines*; Francis S. Pease, Buffalo, New York; patented November 14, 1848, re-issued December 18, 1849.

The patentee says,—“The nature of my invention consists, 1st, in the construction and arrangement of a raking platform, attached to a grass or grain cutting machine. The said platform is made double, and the rake teeth which traverse its upper surface are moved by an arrangement of levers between the top and bottom of the platform, to which motion is given either by hand or by the machine itself. By these rake teeth, the grain, at suitable intervals, is effectually removed from the platform on which it falls when cut.

"2d, In the construction of a rack-bar of wood and iron combined, the stiffness being given by the wood and the strength by the iron, by which combination of materials a rack bar of sufficient strength and stiffness is obtained, yet made lighter and narrower than if constructed entirely of wood, and much cheaper and lighter than if constructed wholly of iron.

"3d, In the construction of rack-teeth of wrought, malleable, or cast iron, with bases sufficiently wide to cover both the top and bottom of the wooden portion of the rack-bar to which they are attached, thus increasing its strength, and protecting it, as well as the cutter-bar which moves within the teeth, from dirt, grass, or grain.

"4th, In the arrangement for attaching the draught, in such manner that the draught can be adjusted to suit any machine to which it is applied."

Claim.—"What I claim as my invention, is alternating the rake, and elevating and depressing its teeth, by devices made, arranged, and operated substantially as described.

"I also claim making a toothed blade case in uniform sections, each section having a tooth cast in one piece with it; the whole being attached to the rack-bar by screws or otherwise, in such manner that if the tooth, or if any section, should get broken, it may be readily replaced by an extra one cast from the same pattern, and kept on hand for that purpose, the rack thus made being equally efficient as a solid case to protect the stock from dirt and obstructions, and can be more easily and cheaply repaired.

"I also claim the manner in which the position of the point of draught is changed, by means of the slides and clamp screws, as set forth.

4. For a *Method of Attaching Sectional Boats to each other by means of a Rule-Joint*; John Elgar, Baltimore, Maryland; patented November 7, 1835, (extended) re-issued December 25.

Claim.—"What I claim as my invention, is the connecting of canal boats by rule-joints, for the purpose of adapting them to the curvature of the canal, and of steering them by their action upon each other, upon the same principle with that by which a rudder is made to steer an ordinary boat."

5. For an *Improved Cushion for Billiard Tables*; Abraham Bassford, City of New York; patented December 5, 1848, re-issued December 25, 1849.

Claim.—"What I claim as my invention, is constructing a billiard or bagatelle table cushion, consisting of an air-tight elastic tube, formed upon, and to be used in combination with, a solid but flexible and elastic core, which core shall remain within the tube and be permanently a part of the cushion, such cushion to be used inflated with air whenever extraordinary elasticity is required, or, on the other hand, capable of being used as a solid elastic cushion, whenever, through accident or choice, the tube part is permitted to lose the air by which it was inflated.

"I also claim the application of air or gas, in a tube or tubes of India rubber or other elastic material, to form the cushion of a billiard or bagatelle table, as described. I also claim the mode of extending the tube or cushion in one length around the table, in consequence of which the tube or cushion may be inflated at the same time with one air pump, whereby all parts are equally inflated, and are of equal elasticity."

6. For an *Improvement in Processes for the Manufacture of India Rubber*; Charles Good-year, New Haven, Connecticut; patented June 15, 1844, re-issued December 25, 1849.

The patentee says,—"The nature of the first part of my invention consists in curing caoutchouc or India rubber, when combined with, or in the presence of, sulphur, by submitting the same to the action of a high degree of artificial heat at a temperature above solar heat: say from 212° to 350° or thereabouts, whereby this substance becomes so changed in its properties as to resist, without material change, the variations of temperature below that under which it is cured; and also the action of the expressed and essential oils and its other known solvents.

"And the second part of my invention consists in preparing and curing the triple compound of caoutchouc or India rubber, sulphur, and a carbonate or other salt, or oxide of lead, for the purposes pointed out."

Claim.—"What I claim as my invention, is the curing of caoutchouc or India rubber, by subjecting it to the action of a high degree of artificial heat, substantially as herein described, and for the purpose specified.

"And I also claim the preparing and curing the compound of India rubber, sulphur, and a carbonate or other salt, or oxide of lead, by subjecting the same to the action of artificial heat, substantially as described."

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7. For an *Improvement in Felting India Rubber with Cotton Fibre*; Charles Goodyear, New Haven, Connecticut; patented June 15, 1844, re-issued December 25, 1849.

The patentee says,—"My invention consists in combining the fibres of cotton or other substance with a sheet of caoutchouc or India rubber, prepared in any desired manner, by laying a bat or fleece of cotton, or other fibrous substance, on to a previously prepared sheet of India rubber or caoutchouc of the required thickness, and in the green state as it is termed: that is, before the India rubber has been subjected to the curing process, and then pressing the fibres of the fleece into the gum by subjecting the whole to the requisite pressure while the sheet of gum is in a soft state."

Claim.—"What I claim as new, is incorporating the fibres of cotton or other substance with India rubber, by pressing the fibres of a fleece or bat of cotton, or other fibrous substance, into a sheet of India rubber in the green state, without subjecting the fibres, after they have been incorporated, to a stretching or drawing operation, substantially as described."

ADDITIONAL IMPROVEMENT FOR DECEMBER, 1849.

1. For an *Improvement in Harness Saddles*; Joseph W. Briggs, Cleveland, Cuyahoga county, Ohio; originally patented June 12, 1849, additional improvement annexed December 11.

The patentee says,—"My improvement consists in rigidly connecting flexible pads to the saddle trees, by means of the nuts which secure the terrets in place."

Claim.—"What I claim as my improvement, is a flexible pad rigidly connected with the saddle tree, substantially in the manner herein set forth."

DESIGNS FOR DECEMBER, 1849.*

1. For a *Design for Stoves*; Daniel F. Goodhue and Charles Guild, Cincinnati, Ohio, December 4.

Claim.—The particular configuration of mouldings around the edge of the doors, and the ornaments on their panels; the external plates of the stove, ornamented substantially as described and illustrated in the drawings; and also the ornamental pattern of legs as shown.

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2. For a *Design for Stoves*; Samuel Hill and William B. Cline, Philadelphia, Pennsylvania, December 4.

3. For a *Design for Cooking Stoves*; Joseph G. Lamb and Conrad Harris, Cincinnati, Ohio, December 11.

4. For a *Design for Stoves*; Dunham, Collier & Sage, assignees of William L. Sanderson, Troy, New York, December 18.

The claims for the above stoves are for the combination and configuration of ornamental designs, &c., substantially the same as described and represented in the respective drawings.

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5. For a *Design for Girandoles*; William F. Shaw, Suffolk county, Massachusetts, December 18.

Claim.—The said design or pattern, or combination of ornamental parts composing the same, in their arrangement in relief, as described and exhibited in the drawings.

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6. For a *Design for Stoves*; William C. Davis, assignee of Hosea H. Huntley, Cincinnati, Ohio, December 25.

Claim.—The combined ornamental design and configuration of stove, substantially as represented in the drawings.

MECHANICS, PHYSICS, AND CHEMISTRY.

On the Manufacture of Iron in South Wales. By HU. L. DAMSEL, ESQ.

To the Committee on Publications of the Franklin Institute.

Gentlemen:—In a recent Journal I saw an article on the state of the iron manufacture in the United States, wherein reference was made to the Welch and Scotch iron works, as well as the position of the British iron trade generally. Being personally acquainted with the Scotch and English works, and having resided for several years at one of the largest and most successfully conducted iron works in the South Wales mineral district, I beg permission to offer a few remarks thereon.

The assertion that “*all* the iron at present manufactured in Wales is of an inferior description in consequence of the inferiority of the ores,” is very far from correct. A considerable portion of the iron at present manufactured, is undoubtedly of an inferior description, and adapted only for certain purposes, but the quality of the remainder is not to be surpassed by any manufactured. Welch argillaceous iron stone from the lower measures when smelted without any admixture of hematite, produces an iron of the best quality, as may be seen in bolts manufactured into chains and similar articles. That the admixture of Lancashire or Cumberland hematites with the Welch ores in the blast furnace improves the quality of the iron is what I much question, for of late years these have been imported on a large scale, and at the present time the annual consumption at the Welch works cannot be much under 150,000 tons. Hence if the use of hematites was beneficial to the quality of the iron we might naturally infer that with this large importation it would have improved, whereas I believe that it has, though in but a slight degree, deteriorated.

I was not previously aware that the Welch manufacturer had any cause for apprehending the destruction of his manufacture by the Scotch malleable iron manufacturer, nor do I believe that any one acquainted with the present condition of the Scotch works would entertain such an idea. It is a well known fact that the facility of manufacturing iron from black band is so great that while it exists the Scotch iron-master will keep possession of the American pig iron market, to the exclusion of all other foreigners, but in the article of bar iron there is much to be accomplished before he can successfully compete with the Welch manufacturer in any foreign market, for notwithstanding the low rates at which pig iron is sold on the banks of the Clyde, the majority of the malleable iron works hitherto established in Scotland, have not proved remunerative to their proprietors, nor do existing circumstances favor the presumption that they will ultimately become so.

The exhaustion of the celebrated black band, (from which nearly all of the Scotch pig is made,) proceeds at a rapid rate, and in a few years will be complete, when the manufacturer will have to fall back on his clay band of a low produce, or on the richer but more expensive ores of Lancashire or Cumberland. Now the cost of manufacturing pig iron from either of these ores will exceed the cost of manufacturing it from black

band by fifteen shillings per ton, therefore with the existing rates of labor and profit, the selling price would be sixty-five shillings per ton, which is quite as high as the present selling price of Welch pigs of mixed qualities. But in addition to this increase of cost consequent on the use of clay band, there will be an immense reduction in the make of the blast furnaces, for it is well known in Scotland that a furnace working on clay band cannot make above two thirds the quantity which it could make if working on black band. Hence, with a diminished supply of band, either the make of pig iron will be reduced, or the existing number of furnaces and blowing engines must be largely increased to enable the Scotch manufacturers to produce a similar quantity of iron from the clay band iron stone.

That the black band is rapidly decreasing in quantity is a fact but too well known to the land owners and iron masters in Scotland, since the royalties demanded and paid on it are now from four to five times as high as those on clay band, and this when it is fetched from fields distant ten or twelve miles from the works, whilst clay band could be obtained in their immediate neighborhood.

The advantages which the Welch iron masters have over the Pennsylvania manufacturers are unquestionably very great, and are every day becoming more striking, for independently of the cheaper rate at which they obtain their raw materials, (coal, iron stone, and limestone,) the large size of their establishments, together with the clocklike regularity with which they are conducted, evidently conduce to reduce the cost of manufacturing. It is principally, however, by means of the improvements which have been effected in the manufacture at the Welch works that their proprietors are now enabled to undersell the American manufacturer at his own market, and not, as most persons on the other side of the Atlantic are apt to imagine, from the mere circumstance of their obtaining their fuel at a cheaper rate. Having been actively engaged for several years with one of the leading manufacturers of the place, in a situation affording unusual facilities for obtaining a thorough practical acquaintance with the different departments of an extensive Welch works, and the system on which it is conducted, I am in a position to speak with some degree of confidence on the present condition of the manufacture as compared with its state eight or ten years ago, and as the subject is one of paramount importance to the owners of mineral lands and iron works in the States, I will with your permission proceed to show what has been accomplished in the different departments in the way of improvement or additional economy during that period.

In consequence of the regular dip of the strata in the South Wales mineral basin, and the situation of the old established works at the outcrop, the Welch iron master has to contend with the serious disadvantage of fetching his minerals from a much greater depth than formerly, and he has also in some cases to pay increased royalties. At one time it was very generally imagined that this increase of depth would so enhance the cost of the minerals as to render it impossible to continue the manufacture with profit, but more recent circumstances have shown that although the depth has been doubled and even trebled, yet the improvement in the engines and other motive powers employed, together with the reduction in the quantity of labor necessary to extract a given quantity of coal and iron stone, and

the cheaper rates at which they are afterwards transported to the works, has more than counterbalanced the disadvantages of depth and increased royalties.

The blast furnaces now building or being repaired are very different in their construction and working arrangements from those which formerly existed. By a more judicious application of the blast, the make of the furnace is largely increased with a diminished consumption of coal, and a greatly reduced expenditure for labor, repairs, &c. One furnace lately repaired and altered, now produces the very large quantity of from 220 to 250 tons of forge iron weekly, with a consumption of only twenty-four cwts. of bituminous coal to a ton of iron. And in consequence of the more general use of steam, in lieu of horses, the charge for removing the cinders, a serious charge at several large works, has been largely reduced.

The continental plan of using the gas from the furnace for heating the blast and generating steam for the blowing-engines, is now under trial at several of the large establishments in this and the adjoining county of Monmouth. At some of the old established works possessing inefficient blast engines, and using badly arranged heating stoves, the consumption of coal is very large, from ten to twelve cwts. per ton of pig iron made in the furnace; but in the more recently erected works, with improved engines and stoves, this is reduced to five or six cwts., by using gas this is further reduced to a few pounds per ton, and the services of stokers and ashesfillers are no longer required.

With the improved refinery, now very extensively adopted, the quantity of coal necessary for refining a ton of iron has been reduced from fifteen to seven cwts., and the waste of iron during the process from eleven to two cwts.; while on the other hand the make has been increased from ninety to one hundred and fifty tons per fire per week, thus accomplishing very important reductions on the former cost of refining the pig iron.

The operation of converting the refined metal into *puddle bars*, is one that has undergone very great improvement, as far as regards the waste of metal and consumption of coal, but in other respects it remains much the same. At some forges, however, the workmen use along with the refined iron a mixture composed of rich hematite and other substances with marked advantage to the quality of the iron. Thorneycroft's patent squeezer (a modification of Mr. Burden's) has been tried at several works, but was not generally considered an improvement on the old reciprocating machine. The waste of iron by the patent apparatus was found to be very considerable, whilst the saving in the item of labor did not exceed two pence per ton, and even if it could be erected as cheaply as the old machine, the saving that would accrue by its use could not exceed three pence per ton at the outside.

The rolling mills lately erected at the Plymouth, Cyfarshfa, Dowlais, and Tredegar works are generally admitted to be some of the most powerful and complete of their kind ever erected. Each of these mills contains four trains of rolls, driven by a large high pressure steam engine, with a cylinder sixty inches diameter, and are fitted with saws, cropping shears, and all other gearing of the latest design and in the most substantial manner. The working machinery is made unusually strong, partly with the view of preventing as much as possible all accidental breakages,

and partly with the view of economy in the working expenses. Experience has demonstrated that they are well adapted for this, as their working expenses are exceedingly low, and the utmost regularity, without which no work of any magnitude can ever be profitably conducted, has been obtained.

The improvements which have taken place in the rail department are remarkable for their boldness and ingenuity, one of the most striking is the large quantity of rails which a well arranged and well conducted rail mill can now make weekly. A few years since 200 tons a week was considered a great make, now it is 400 and 500 tons, and even 1000 tons has been made in a large and very powerful rolling mill recently erected near Merthyr Tydvil. The operations of piling, heating, and rolling the rail bars are now conducted on an improved system, by which the loss which formerly occurred from defective rails is reduced to a minimum, and by substituting steam for manual power in the finishing processes of sawing, filing, straightening, &c., the charge for these is reduced to one half, and in some instances to one third, of what was formerly paid.

The merchant bar, slitting, and guide mills, have also participated in the general advancement. Bars and rods are now rolled of lengths varying from forty to sixty feet, being afterwards cut to the required dimensions, by which means the quantity of crops produced, the amount of labor employed, the consumption of coal in the heating furnaces, and the time occupied in rolling a given quantity of bars, are all largely reduced.

Whilst these reductions have been effected in the more important departments, the inferior ones have not been neglected. Fire bricks of a superior quality are now manufactured in immense quantities at a very trifling cost, and the foundries, smith's, machine and other shops, are with but few exceptions on a scale adapted to making, repairing, or altering engines and machinery of the heaviest class in the shortest time and in the most economical manner.

Reduction in the cost of producing the metal being the constant aim of every manufacturer in the district, the majority of them have been led to frame and establish most elaborate systems of book-keeping, by which the expenditure under each department is analyzed in such manner that a mere glance is sufficient to detect and trace to its source the slightest increase of expense, or the least negligence on the part of workmen or agents. In fact the system is carried to such an extent that in some of the large works employing from 3000 to 4000 persons each, the proprietors are perfectly well acquainted with the degree of skill and merit possessed by every workman in their employ.

By these several improvements and reductions the large Welch manufacturers are now enabled to manufacture a ton of rails or other bars from the ore with a consumption of only four tons of semi-bituminous coal, and with a diminution in the quantity of labor, charges for stores, expenses of repairs, &c., of from thirty to fifty per cent. on what was formerly required.

How far these improvements and reductions are applicable to existing American works I am not in a position to say, so large a proportion of them having been but recently erected; presuming, however, that they are generally so, it will not be difficult to ascertain the amount which the manu-

facturers can afford to give for the carriage of their iron to market, and the coal consumed in its manufacture.

The present cost of manufacturing railway bars in this district, (including transit to the nearest shipping port, twenty-three miles from the works,) is about eighty-five shillings per ton. The expense of coals to manufacture a ton of bars from the ore, (four tons at five shillings per ton,) amounts to twenty shillings, which deducted from the above leaves sixty-five shillings per ton for the cost of the ores, and all other expenses incurred in the different processes of the manufacture.

Estimating the present selling price of railway bars of average quality in New York and Philadelphia at forty-five dollars per ton, and deducting seventy-eight shillings, or nineteen dollars and a half, for the cost of ore, labor, and all other expenses incurred by the American manufacturer, at rates twenty per cent. higher than those paid by his Welch competitor, there remains twenty-five dollars and a half to cover the cost of coal and any other extra expense of bringing the iron to market. If the four tons of coal required in the manufacture, and the additional carriage of the iron above the twenty-three miles, cost twenty-five dollars and a half per ton, there can be no profit, but if they cost less, then the difference will exhibit the profit per ton which would accrue to the proprietors; if the works were conducted on the Welch system, at a very moderate calculation the works manufacturing bars through all the different stages from the raw ore, ought to make net returns of ten dollars per ton of rail, or other large bars, made when the selling price is forty-five dollars.

The iron companies whose operations are limited to the conversion of pig into bar iron, at works on the sea board, undoubtedly labor under a greater disadvantage in the higher price of their coal, and it is but too certain that with iron at present rates, a large proportion of them cannot pay, but the case is different with others. If pigs are to be had for twenty-one dollars per ton, the quantity required for producing a ton of bars, twenty-four and a half cwt., will cost twenty-six dollars, and if to this we add six dollars for the labor employed, stores consumed, wear and tear of machinery, &c., during the conversion, at rates one fourth higher than in this district, the expenditure under these heads is thirty-two dollars per ton, which deducted from the selling price of rails, say forty-five dollars per ton, leaves thirteen dollars to cover the cost of the fuel. Two tons of semi-bituminous coal will be sufficient for the operations of refining, puddling, and milling, and works where this is to be obtained for the thirteen dollars, or six dollars and a half per ton, might be kept going without positive loss to their proprietors.

The above calculation refers to railway and common size bars, but in some localities the manufacture of smaller sizes would be attended with greater profit, as these command higher rates in consequence of the extra labor and finish bestowed on them, and imported bars do not always come to market in the best condition. Their selling price would probably average four to five dollars above cost price. It must be borne in mind, however, that the make of such bars from a rolling mill is inconsiderable, probably not above fifty to sixty tons weekly.

It may be necessary for me to remark that the increase of twenty and twenty-five per cent. on the rates paid in Welch works will at first sight

appear too little, but if the whole of the circumstances connected with the American works be taken into consideration, it will be seen that so far as the price of labor is concerned the difference in favor of the Welch manufacturer is very trifling indeed.

In conclusion, permit me to state, that although the iron manufacture of the United States is now in a most depressed condition, by reason of the large importations of foreign iron, yet the time is not far distant when the mineral regions of Pennsylvania and the Western States will produce an abundance of iron, which for quality or cheapness will be far preferable to any imported, and when Americans will be not only independent of foreigners for their supply of iron, but they will be exporting it in the raw and manufactured state to all parts of the globe.

Cardiff, Glamorganshire, South Wales, March, 1850.

For the Journal of the Franklin Institute.

Investigation of the Proper Profile of the Top Beam of a Crane with Moveable Carriage. By H. BACMEISTER, *Norris Locomotive Works, Schenectady, New York.*

It is desired to so form this profile as to secure these two ends, viz:

I. That the weight may continue at the same level during its movement.

II. That the power and the weight may be every where in equilibrium.

The profile necessary to satisfy each of these conditions will be successively investigated.

I. Geometrical Condition.

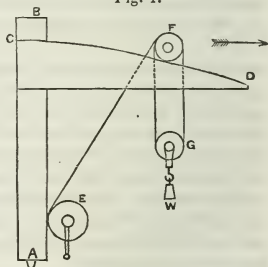
I. Let AB be the vertical shaft of a crane, to the upper extremity of which is attached the beam CD. The hoisting rope is wound over the drum E, and thence passes to the block and tackle FG. The weight W is suspended from the lower block G, while the upper block F forms a carriage which may be moved along the upper surface of the beam CD, carrying with it the weight W.

II. Now suppose the carriage F to be moved in the direction of the arrow, the drum E remaining stationary. The rope EF will be lengthened, and FG be shortened proportionally. The weight W will therefore be raised if the top of the beam CD be horizontal. It will also be lowered when the carriage is moved in the contrary direction.

But it is often required in practice that the weight should neither rise or fall during its movements along CD. To attain this end it will be necessary to make the top surface of the beam CD a curve, whose nature will now be investigated.

III. To simplify the solution of this problem we will neglect the diameter of the drum (which is very small in proportion to the other dimensions involved) and substitute for it a point E in the middle of that part

Fig. 1.



of its circumference to which the rope EF is tangent in its different positions.

Let now C be a point situated vertically above E, and representing the centre of the carriage in its first position.— Draw CM perpendicular to EC. Let F be another position of the centre of the carriage. Let WW', be the respective positions of the weight corresponding to the two positions, C and F, of the carriage. By the conditions of the problem, the line WW' will be horizontal.

Let n denote the number of pullies in the block and tackle, or the number of cords passing to and from the rising block G, (fig. 1.) Then will the elongation of the rope EF, in passing from C to F, be equal to n times the decrease of the distance CW; i. e.

$$EF - EC = n(WC - W'F.) \quad (1.)$$

Making now CE the axis of abscissas, and CM the axis of ordinates, and drawing from F the lines FI and FH respectively perpendicular to those axes, we will have

$$EF = \sqrt{IF^2 + EI^2} = \sqrt{IF^2 + (EC - IC)^2};$$

and, denoting the constant distance EC by a ,

$$EF = \sqrt{y^2 + (a - x)^2};$$

$$\text{Also, } WC - W'F = FH = IC = x.$$

Substituting these values in (1,) we get

$$\sqrt{y^2 + (a - x)^2} - a = nx.$$

$$\text{Whence, } y^2 = (n^2 - 1)x^2 + 2a(n + 1)x, \quad (2.)$$

$$\text{Or, substituting } \frac{n^2 - 1}{n - 1} \text{ for } n + 1,$$

$$y^2 = (n^2 - 1) \left(x^2 + \frac{2a}{n - 1} x \right)$$

$$\text{Whence } y = \sqrt{n^2 - 1} \sqrt{x^2 + \frac{2a}{n - 1} x}, \quad (3.)$$

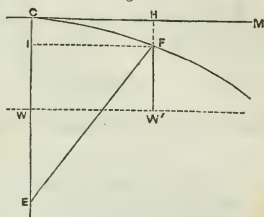
Which expression is the equation of an *hyperbola*, the axis of ordinates passing through one vertex of the curve.

IV. To determine the *semi-major axis*, α , and *semi-minor axis*, β , of this hyperbola, we have from (3)

$$\frac{\beta}{\alpha} = \sqrt{n^2 - 1}, \text{ and}$$

$$\alpha = \frac{a}{n - 1}, \quad (4.)$$

Fig. 2.



$$\text{Whence } \rho = \sqrt{n^2 - 1} + \frac{a}{n - 1} = a \sqrt{\frac{n + 1}{n - 1}}. \quad (5.)$$

V. To find the position of the *focus*, i. e. its distance d from the vertex C, we have the equation

$$d = \sqrt{a^2 + \rho^2} - a = a \left[\sqrt{1 + \frac{\rho^2}{a^2}} - 1 \right]$$

Substituting and reducing, we get $d = (n - 1)a$, or from (4)

$$d = a \quad (6.)$$

i. e. the focus of the hyperbola coincides with the point E.

When the rope passes over only one pulley, $n = 1$, and equation (2) becomes

$$y^2 = 4ax,$$

The equation of a *parabola*, whose focus also coincides with the point E.

II. Statical Condition.

VI. The profile required to satisfy the second, or *statical condition*, enunciated above, will be now investigated.

The rope EF exerts a force at the point F, whose horizontal component tends to move the carriage (and weight) backwards towards C. In order to enable the weight to counteract this tendency by opposing its gravity thereto, the top of the beam must be a *curve*. We are now to investigate this curve of equilibrium.

VII. As before, let CM and CE, be the co-ordinate axes, F the centre of the carriage in a certain position, $CE = a$, and $n =$ number of pulleys.

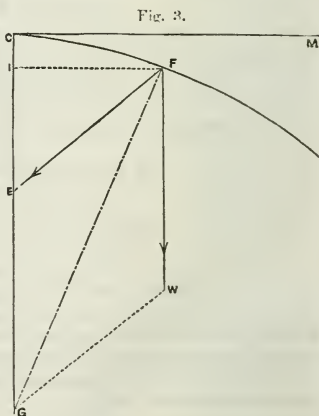
The vertical force, acting at F, equals the weight W. The oblique force acting at the same point equals the tension of the rope $EF = \frac{W}{n}$.

The two forces are therefore to each other as $1 : n$. Their direction is known, and their resultant is the diagonal of their parallelogram.

Thus, in figure 3, representing the oblique force by EF, and the vertical force by FW = EG, the diagonal FG is the resultant required.

The *condition of equilibrium* now is that the curve of the beam shall be normal, at the point F, to this resulting diagonal. We will now express this analytically.

VIII. As before, let $CI = x$, and $FI = y$, be the co-ordinates of the point F. Since FG is normal to the curve at the point F, GI is the sub-



normal for the same point, and is expressed by the product of the ordinate into the differential coefficient, i. e. $GI = y \frac{dy}{dx}$.

$$\text{But } GI = GE + EI, \quad (7.)$$

$$\text{And } GE = n \times FE,$$

$$\text{And } FE = \sqrt{FI^2 + IE^2} = \sqrt{y^2 + (a - x)^2},$$

$$\text{Also, } EI = a - x.$$

Substituting these values in equation (7) we get

$$y \, dy = (a - x) \, dx + n \, dx \sqrt{y^2 + (a - x)^2}, \quad (8.)$$

Which is the *differential equation* of the curve of equilibrium and is now to be integrated.

IX. Separating the variable quantities under the radical, and reducing further by putting

$$a - x = z$$

$$y = z \sqrt{v^2 - 1}, \quad (9.)$$

We obtain, after an easy reduction,

$$(v + n) \, dz + z \, dv = 0.$$

$$\text{Whence } \int \frac{dz}{z} + \int \frac{dv}{v + n} = c,$$

And $vz + nz =$ a certain constant quantity to be derived from the conditions of the problem, and here $= a + na = (n + 1) a$.

Replacing v and z by their values from (9) we obtain, after an easy reduction,

$$y^2 = (n^2 - 1) x^2 + 2 a (n + 1) x. \quad (10.)$$

X. From the perfect identity of equations (2) and (10) it appears that the conditions on which we based the geometrical solution of this problem as enunciated in § II, are identical with the conditions of equilibrium as given in § VII. That this is not merely an accidental but a necessary result, may easily be inferred from the consideration that the condition that the weight suspended from the carriage shall neither rise above nor fall below its original position, is nothing more nor less than the condition of equilibrium itself.

For the Journal of the Franklin Institute.

Who Invented Parker's Water Wheel?

This is the title of a short article in the *Practical Mechanics' Journal* for March, published in Glasgow, the substance of which is as follows:—"I observe in the *Civil Engineer and Architect's Journal*, an article copied from the *American Franklin Journal*, giving an account of what is there called "Parker's Water Wheel." The improvement claimed in this article is the invention of Koechlin & Co., of Mulhouse, and is patented by

them. A description accompanied with drawings and several valuable tables containing the results of a series of experiments made upon two of their wheels, to determine their effective working power, was read at a meeting in August, 1843, of the Société Industrielle. This description and tables, together with the reports of the committee appointed to investigate the merits and conduct the experiments, is published in the Transactions of the Society, vol. XVIII." Then follows a short piece of that coarse abuse in which British periodicals used to be in the habit of indulging towards Americans, but which, for some time past, very shame has banished from their respectable journals, and which, no doubt, would have had the pen drawn through it had it met the eye of the editor of the Practical Mechanic.

To such language, no one will expect us to reply, either in defence or by recrimination, be the opportunity ever so tempting; on the contrary, we might with propriety refuse to reply even to the facts alleged in such attacks. We shall, nevertheless, not take advantage of this privilege, but reply strictly, that a description of the Koechlin turbine, taken from the Civil Engineer and Architect's Journal, will be found in our Journal for 1845. (3d series, vol. ix, p. 222.) The analogies to Parker's wheel are the helical sluice (*d* of the figure) and the contracted air-tight box. The first of these was patented by Austin and Zebulon Parker in October, 1829, (see Journal Franklin Institute, 2d series, vol. v, p. 33,) and the latter by Zebulon Parker and Robt. M'Kelvey, administrators of Austin Parker deceased, on 27th June, 1840, (Journal Franklin Institute, 3d series, vol. ii., p. 135,) or three years before the paper describing Koechlin's turbine was read before the Société Industrielle of Mulhouse. We think this explanation will be found sufficient as to the question who invented Parker's wheel; and we hope that the editor of the Practical Mechanic's Journal, will republish it for his own sake and for the information of his readers. As to the rest, Mr. J. G. may think it shows contempt for the Americans to affect ignorance of what they have done or are doing, but such ignorance excites no feeling here except that of regret for him who exhibits it.

F.

New Process for extracting Sugar from the Sugar-Cane. By M. MELSENS.*

The following account of the new and important method of extracting sugar from the sugar-cane, is abridged from the first of two long articles recently published in the *Courier de l'Europe*.

The great difficulty which has been experienced up to the present time in the preparation of sugar, has been owing to the rapidity with which it, when dissolved in water, alters by exposure to the air in hot climates.—It must, however, be clear, since the cells of the sugar-cane are themselves full of sugar dissolved in water, and this solution can be kept for a long time in them, without undergoing any alteration at all, that if the same conditions which exist in nature could only be obtained in practice, there is no reason why an artificial solution of sugar may not be kept unaltered for a considerable space of time; or in other words, why water should not

* From the London Chemical Gazette, January 15, 1850.

be used for the purpose of dissolving the sugar out of the crude juice expressed from the cane.

The difficulties, indeed, are not owing to the sugar or to the water, but to the air, and the ferments produced by its action on the crude sap of the sugar-cane. The object of M. Melsens was, then, to exclude the air from the sap when extracted from the cane, and to prevent the formation of any ferments which might change the character of the saccharine matter.— This he has succeeded in doing by availing himself of the well-known affinity of sulphurous acid for oxygen gas. Sulphurous acid, however, alone was found not to answer the purpose; the sulphuric acid, produced by the absorption of oxygen by sulphurous acid, acting on the sugar, converts it into grape-sugar. This difficulty has been overcome by using sulphurous acid combined with a powerful base, which, as the sulphurous acid is converted into sulphuric acid, combines with the latter and forms an insoluble salt.

The acid sulphites, and more especially the bisulphite of lime, were employed by M. Melsens for the double purpose of preventing fermentation by the action of the sulphurous acid, and of neutralising the sulphuric acid as fast as it formed by means of the lime.

Sugar-candy dissolved in cold water containing bisulphite of lime, even in excess, crystallized entirely, and without undergoing any change, by spontaneous evaporation, at a low temperature. Several other experiments of the same nature, but differing in their details, always gave the same result; in each the sugar crystallized out by spontaneous evaporation, without any loss either in quantity or in quality, and without any appearance of molasses. In these experiments, the sugar dissolved in water, containing bisulphite of lime in excess, was boiled, and then left to evaporate, sometimes after being filtered, sometimes without any filtration at all.

From the experiments which M. Melsens has made with bisulphite of lime, it is probable that if a cold solution of this salt were to be poured on the sugar-cane grinder, so as to mix with the juice the moment it is expressed from the cane, the sugar might be kept for some time, and might be exposed to the heat necessary for its clarification without any sensible loss or deterioration.

But this same salt also possesses the property of coagulating, at a temperature of 212° , milk, white of egg, blood, and yolk of egg mixed with water. At a temperature of 212° , bisulphite of lime acts as a clarifier.— It separates the albumen, caseum, and other similar azotized matters which are found in the sugar-cane. This separation is effected without appreciable loss in the quantity, or deterioration in the quality, of the sugar.

Bisulphite of lime, moreover, rapidly and tolerably effectually bleaches the colored substances found in the sugar-cane; it prevents the formation of other colored matters produced by the action of air on the pulp of the cane; it also stops the production of those which are formed during evaporation, and above all of those which require for their development the joint action of air and a free alkali.

It seems that colored substances, which, under ordinary circumstances, are formed spontaneously by the exposure of the pulp of the sugar-cane to the air, never make their appearance when bisulphite of lime is employed. By evaporating, at a low temperature, bisulphite of lime mixed with—1,

a common solution of sugar; 2, the crude sap of the sugar-cane; 3, the juice of beet-root; no coloration was produced. By an evaporation of the same substances at a high temperature, the coloration was scarcely visible; indeed, with red beet-root the color was completely destroyed, and the sugar obtained was perfectly white.

It seems, then, that bisulphite of lime can be employed in the extraction of sugar:—1st, as an antiseptic, preventing the production and action of any ferment; 2nd, as a substance greedy of oxygen, opposing any alteration that might be caused by its action on the juice; 3rd, as a clarifier, coagulating at a temperature of 212° all albuminous and other coagulable matters; 4th, as a body bleaching all pre-existing colored products; 5th, as a body opposing itself in a very high degree to the formation of colored substances; 6th, as a base capable of neutralising any hurtful acids which might exist or be formed in the juice, and substituting in their place a weak inactive acid, namely, sulphurous acid.

M. Melsens is of opinion that sugar can be obtained from the sugar-cane with no other source of heat than a tropical sun, excepting only for the purpose of clarification; indeed, the bisulphite of lime prevents the crude juice of the cane, or the syrup obtained therefrom, from undergoing any changes; great rapidity in the process of crystallization, indispensable at present, becomes by using this salt unnecessary; and more than this, the quantity of sugar which is now lost in the bagasse, in consequence of the impossibility of washing it out unchanged, can be all collected by being dissolved in water charged with bisulphite of lime.

The only objection that can be made to the above process is, that the sugar obtained by means of bisulphite of lime has a sulphurous taste; this is true, but the taste is completely lost—1st, by crushing the sugar and exposing it to the air, whereby the little sulphite of lime which there may be is converted into a tasteless sulphate; 2nd, by exposing the sugar to an atmosphere containing ammonia; if this is done the sugar acquires a very agreeable flavor of vanilla, but is apt to become a little discolored; 3rd, by clarifying it until it loses 10 per cent. of its weight; by this process a pure white sugar can be obtained, which will bear comparison with any sample produced at present. The last is the process recommended to be used on a large scale. The quantity of sugar fit for the market which can be obtained from the sugar-cane by adopting bisulphite of lime, as above recommended, is at least double that obtained by the usual processes.

In consequence of M. Melsens having made all his experiments on the sugar-cane at Paris, and therefore on a small scale, he is not able to state how bisulphite of lime can best be used in the large colonial sugar manufactories, but is compelled to leave the application of the principles on which his method depends to the intelligence of the manufacturers themselves.

In the preparation of beet-root sugar bisulphite of lime is quite as useful as in the extraction of cane-sugar; the way in which it is to be employed in the former is fully explained in the second article published in the 507th number of the *Courier de l'Europe*, to which we must refer those among our readers who desire any further information on the subject.—*Gard. Chron.*, Dec. 15, 1849.

For the Journal of the Franklin Institute.

Description of the United States Steamer "Susquehanna."

This fine naval steamer, one of the four now building for the Government, was launched on the 13th of April from the Philadelphia Navy Yard. As she is one of the largest war steamers belonging to the Navy, (the other of the same size being the "Powhattan,") her dimensions will be of interest to the readers of the Journal.

	Feet.	Inches.
Length on deck,	256	6
Breadth of beam,	45	
Depth of hold,	26	6
Draft of water when loaded,	19	
Tonnage, 2436 tons.		

She is to be propelled by two inclined engines, the frames being of wrought iron.

	Feet.	Inches.
Diameter of cylinders,	5	10
Length of stroke,	10	
Diameter of air pump,	4	
Length of stroke,	3	4
Diameter of condenser,	6	3
Height of "	3	3
Diameter of water wheels,	31	
Width of "	9	6
Number of arms in each centre, 26, having 26 split paddles, forming 52 of 17 inches by 9 feet 6 inches.		
Number of flanches in each wheel, 3.		
Whole number of arms in each wheel, 78.		
Size of arms, $5\frac{1}{2} \times 1\frac{1}{4}$.		
Diameter of shafts in main journal, 18 inches.		
" connecting rods, in neck 7 inches, in centre $9\frac{1}{2}$.		
" piston rod, 7 inches.		
Steam passages in cylinders, $42 \times 8\frac{1}{2}$.		
Area of foot valve, 752 inches.		
Four copper boilers, 15 ft. 9 in. long, 14 ft. 1 in. wide, 12 ft. 9 in. high.		
Number of furnaces in each boiler, 3.		
Length of grate, 6 ft. 6 in.		
Diameter of chimney, 8 ft. 4 in.		
Height of " 45 ft. 9 in.		

The engines were designed by Charles W. Copeland, Esq., and constructed by Murry & Hazlehurst, of Baltimore. The whole will be completed by the 1st of August. B.

Translated for the Journal of the Franklin Institute.

On the Elliptical Double Refraction of Quartz.

At the session of 4th February of the Academy of Sciences of Paris, M. Jamin read a memoir upon the elliptical double refraction of quartz, in which he gave an account of a series of experiments upon a section of quartz cut obliquely to the axis, for the purpose of verifying the ingenious hypothesis, by means of which Prof. Airy had proposed to account for the phenomena which appear under these conditions. The following conclusion is very interesting in connexion with the memoir of M. Cauchy alluded to at page 280.

"Simple as it (the hypothesis of M. Airy) is, probable as it appears, this hypothesis is, nevertheless, not true; it satisfies the limits of the problem but is always disaccordant with experiment in intermediate cases.

"I then requested M. Cauchy to apply his general theory of double refraction to rock-crystal; he agreed to devote his attention to the problem, and was lead to formulæ of great complication. But, by introducing the restriction that the angles of refraction shall be very small, they were reduced, for a first approximation, to a very simple form. As experiment had shown me that the particular phenomena of quartz cease to be visible at a small distance from the axis, I accepted this first approximation, as likely to be sufficient, and found that the formulæ were admirably in accordance with experiment.

"I ought, however, to explain, that the experiments which I submit to the Academy have been finished for more than a year; and that when I requested M. Cauchy to develop the theory of them, I did not communicate to him the results to which I had come; it was, therefore, without any experimental action, and without any guide except himself, that M. Cauchy found the solution of the problem; and when it was communicated to me, a few hours of calculation were sufficient to show that it reproduced the experiment exactly, without it being necessary either to modify the formulæ to render them exact, or to recommence the experiments with the desire to make them coincide with the theory.

"Plates of quartz placed in the path of light polarized rectilinearly or circularly, offer, as is known, very various appearances, which M. Airy had succeeded in explaining, but which we can now reproduce and of which we can now calculate all the peculiarities; we may, therefore, consider the complicated phenomena which crystals of quartz present, as being entirely known."—*Comptes Rendus de l'Acad. Sci., Paris, tom. xxx. p. 99.*

For the Journal of the Franklin Institute.

Description of the Steamship "Atlantic."

This gigantic steamer, the first finished of Collins' New Liverpool Line, made a trial trip on the 20th of April, and performed to the satisfaction of all on board. A good deal of interest was felt as to the success of her boilers, but they are reported to have given an abundant supply of steam with a moderate amount of fuel. The boilers are four in number, back to back, having one common chimney. Each boiler is 22 feet 2 inches long, 13 feet 8 inches wide, and the same in height in front. There are two rows of furnaces, one above the other, or eight furnaces to each boiler; the lower furnaces have grates 7 feet 4 inches long, and the upper ones are 5 feet 4 inches long. Back of the bridge-walls are 37 rows in depth of 2-inch tubes, placed vertically, through which the water circulates. The external surface of these tubes, in connexion with the water legs or division between the furnaces, constitutes the principal amount of fire surface. The tubes are 5 feet and 4 feet 6 inches in length, about equally divided, or one-half of each. The engines are two in number, with side levers; cylinders 95 inches diameter, 9 feet stroke; water wheels 36 feet diameter, 12

feet 6 inches wide, and, with 1000 tons of coal on board, carrying 10 lbs. steam at sea, and cutting off at half stroke, made 12 revolutions.

The engines are the best specimen of marine engines yet produced in this country, and the frames are particularly worthy of note, as being braced in a very secure manner. They were designed and built by Stillman, Allen & Co., Novelty Works, New York, and the boilers were designed by Mr. John Faron, Jr., recently deceased, who was Chief Engineer of the line.

The hull is a splendid specimen of naval architecture, and has never been surpassed for strength or beauty. There is a diagonal frame-work of iron extending from the bilge to the upper deck, and running the whole length of the vessel. It is composed of bars 45 feet long, 6×1 inches, placed at a distance of 4 feet apart, and let into the timbers their thickness. This iron frame-work is firmly secured to the wooden frame, so as mutually to support each other. The extreme length on deck is 290 feet, breadth of beam 46 feet, depth of hold 32 feet, and by Custom House measurement she is 2900 tons. The finish of her cabins can hardly be described; it is of the richest character, and composed principally of rose wood, satin wood, oak, &c., inlaid.

She has accommodations for 200 first class passengers, and besides her fuel, can carry 1000 tons of goods. Great expectations are entertained in relation to her speed, but I am glad to see that her owners and builders have not countenanced any high wrought statements. A few trips will soon test everything, and I have no fear but she will be a credit to her builders, whether in speed she surpasses the new Cunard steamers, "Asia" and "Africa," or not.

The cost of the "Atlantic" is \$550,000, one-half of which sum was expended on her machinery. She is commanded by Captain James West, formerly of this city, and the 1st, 2d, 3d, and 4th officers are past midshipmen of the U. S. Navy. The Chief Engineer is Mr. J. W. Rodgers, one well known in his profession, and he has six assistants.

The "Pacific" will succeed the "Atlantic" in about two months; her machinery is building at the Allaire Works. The "Baltic" and "Artic" will not be ready before fall.

B.

Translated for the Journal of the Franklin Institute.

Note on the Superficial Conducting Power of Crystallized Bodies, for Electricity of Tension. By M. G. WIEDEMANN.

The method used by the author consists in using a plate of the crystal to be examined, upon the centre of which he rests a metallic point which is made to communicate with the positive knob of a Leyden jar. The surface of the crystal being covered with a light powder, such as lycopodium, when the point is charged, the powder is seen to be brushed away from a certain portion of the surface adjacent to it, if the crystal be a bad conductor such as gypsum; when, however, the crystal is a better conductor, as in the case of feldspar, the powder around the point adheres more strongly, and by tapping the crystal carefully the rest of the powder may be discharged, while the portion around the point remains. This electrified area

has its dimensions unequal in different directions. The results are independent of the form of section of the point, for in using points of different sections, the figures on the glass remained the same. With a plate of glass, the figure was a circle. The following are M. Wiedemann's general conclusions:

1. The direction of the figure is independent of the striæ which mark the surface of certain crystals.

2. With calc-spar, arragonite, apatite, and tourmaline, the figure is elliptical, the major axis being parallel to the principal axis of the crystal. With other crystals which do not belong to the regular system, it is perpendicular to it. In regular crystals the figure is a circle, as upon glass.

3. Assuming that this major axis coincides with the direction of greatest conducting power, we may lay down the following conclusion, that "in negative crystals the direction of greatest conducting power coincides with the principal optical axis of the crystal; in positive crystals, it is at right angles to it, excepting the case of feldspar, which appears to follow the opposite law." M. Wiedemann explains that these results were published in Germany before the date of the experiments of M. de Senarmont upon the same subject.—*Comp. Rend. Acad. Sci. Paris*, tom. xxx. p. 110.

Translated for the Journal of the Franklin Institute.

Note on a Means of Causing an Electrical Machine to Work in all Weathers. By M. MUNCH.

This means consists in tracing a slight line of tallow on each side of the plate from the centre to the circumference. If this be done in weather when scarcely anything can be got from the machine, it will be seen, from the first turn of the plate, that every thing is changed and that it will perform perfectly. If the glass pillars which support the conductor are not covered with a coating of gum-lac, tallow should also be applied lightly to them, and then rubbed off with a dry cloth.* It is evident that in these operations the object is to interpose an imperceptible coating of fatty matter between the surface of the glass and the ambient air charged with aqueous vapor.—*Comp. Rend. Acad. Sci. Paris*, tom. xxx. p. 47.

On Some Phenomena of Reduction: a New Method of Separating Iron from its Compounds. By J. A. POUMAREDE.†

Some years ago the author examined the action of some metals, and especially that of zinc, upon metallic solutions. On bringing together solutions of iron, cobalt, nickel, and manganese, the decomposition of the water and the disengagement of hydrogen appeared to him not to be produced by the zinc, but by a certain quantity of the dissolved metal, precipitated by that antagonism which is always exhibited when two different radicals occur in the presence of a limited amount of oxygen, coating the

* New Edinburgh Encyclopedia, (Am. Ed.) Vol. viii., p. 334, where the authority of Mr. Nicolson is cited for this mode.

† From the London Chemical Gazette, April 1, 1850.

reducing metal, and producing in this manner a galvanic element. To demonstrate that such might really be the case, it was necessary to establish that this reaction, which might be expressed by the following equation, $2(\text{Fe}^2 \text{O}^3, 3\text{SO}^3) + \text{Zn}^3 + \text{HO} = \text{Fe}^3 \text{O}^3, 3\text{SO}^3 + \text{Zn}^3 \text{O}^3, 3\text{SO}^3 + \text{FeO} + \text{H}$, might also take place in the following manner:— $2(\text{Fe}^2 \text{O}^3, 3\text{SO}^3) + \text{Zn}^3 + \text{HO} = \text{Fe}^3 \text{O}^3, 3\text{SO}^3 + \text{Zn}^3 \text{O}^3, 3\text{SO}^3 + \text{HO} + \text{Fe}$.

The author succeeded, in fact, in doing this by quickly removing the precipitate of reduced metal from the zinc, and so preventing the formation of a galvanic circuit; instead of the hydrogen there now appeared a corresponding quantity of metallic iron. After further examination of these phenomena, the author has not attained the desired result in a scientific point of view; he has, however, discovered the following three methods for the reduction of iron:—

1. *Salts of the Protoxide of Iron*, under the above mentioned circumstances, part with half their oxygen at a slight elevation of temperature, the corresponding amount of iron being separated in a metallic form. Such iron can be prepared at very little cost, and it will undoubtedly find some useful application in the arts. It is purer than the ordinary iron of commerce, has the usual color, and all the other properties of iron, and the specific gravity of 7.50.

2. *Protochloride of Iron* may be reduced by zinc in the state of vapor. The iron so obtained is well adapted for the reduction of a number of other protochlorides; it always forms dendritic crystals, among which occur here and there hollow tetrahedra. Its specific gravity is 7.84, which is nearly the same as Broling assigns to iron melted into bars. Its purity is so great that it decomposes water only imperceptibly in dilute sulphuric acid.

3. The carbon, whose influence the author had distinctly recognized in the previous reduction, has been especially examined as regards its reducing action, and application made of well known facts, in which he assumes the views brought forward by Leplay and Laurent on cementation to be proved.

When peroxide of iron (colcothar) or protocarbonate of iron is heated with charcoal, the oxide of iron being packed in shallow sheet iron vessels with intervening strata of carbon placed upon iron wire sieves, in a cast iron cylinder placed vertically in a reverberatory furnace, and the upper part of which is connected by a tube of sufficient length with the atmosphere or the requisite apparatus, and it is now heated to a red heat; there is observed during the entire operation a disengagement of carbonic oxide, which may be immediately employed for other reductions. The peroxide or protocarbonate of iron is converted into porous iron, which is not pyrophosphoric and has all the properties of a very pure iron.

To explain this behaviour, we must admit, according to Leplay and Laurent, that the atmosphere of the apparatus first produces with the carbon a quantity of carbonic oxide, which reacts upon a corresponding amount of peroxide of iron, and furnishes carbonic acid; this is next reduced by the charcoal to carbonic oxide, which then constitutes twice the amount first present. In this manner, after a short time, the oxide is placed in a reducing atmosphere. By this method the author has reduced a number of other compounds, for instance the alkaline and earthy sulphates.—

Comptes Rendus, xxix. p. 518.

Translated for the Journal of the Franklin Institute.

Premiums Awarded for the Introduction of Improved Methods in Arts regarded as Unhealthy.

At their session of 4th February, 1850, the Academy of Sciences of Paris, on the recommendation of a committee appointed to report upon "various inventions intended to render an art or profession less unhealthy," awarded the following premiums.

2500 francs to M. Leclaire for "the preparation on a large scale of zinc white, and its introduction into house-painting by means of a drying oil prepared by manganese."

2500 francs to M. Rocher, "for an economical apparatus for distilling sea-water on board of ships, using the heat of the culinary apparatus."

Translated for the Journal of the Franklin Institute.

Double Piston Steam Engine. By M. PALTRINERI.

"In this machine the steam cylinder has two pistons which move in opposite directions; a single valve box suffices to lead the steam at one time to the middle of the cylinder, when the pistons are to be driven outwards, at another to the ends, when they are to be driven inwards. The author points out various applications of this system, for locomotives, and for steam ships of great power, and he has succeeded in some of them in making very simple arrangements, which allow the reduction of the dimensions and consequently of the weight of the apparatus."—*Recueil de la Société Polytechnique*, June, 1849.

On the Heat of the Vaporization of Water. By J. P. JOULE.*

The object was to point out the complex nature of the heat hitherto taken from the latent heat of steam. In the exact experiments of Regnault 965° was found to be the quantity of heat evolved in the condensation of steam saturated at 212° ; of this quantity 75° is the heat due to the *vis viva* communicated by the pressure of the steam, leaving 890° as the true heat of vaporization of water. In a perfect steam engine supplied with water at 212° , and worked at atmospheric pressure without expansion, 965° will be the heat communicated from the fire to the boiler, 75° will be the heat utilized by conversion into force, and the remainder 890° will be the heat given out in the condenser.—*Proc. Brit. Assoc.*

Fire Bricks for Furnaces.†

The *Morning Chronicle* Commissioner, in his letter from Merthyr Tydvil, gives an account of a curious branch of industry carried on there—namely, the making of fire bricks for lining the furnaces, and, indeed, for all other purposes where a material is required capable of withstanding intense and long continued heat. There are two substances, found in abundance in

* From the London Civil Engineer and Architect's Journal, for November, 1849.

† From the London Artizan, for April, 1850.

the coal and iron districts, which have the property of resisting in a high degree the action of fire; the one is termed "fire clay," a stratum of which is often overlaid by coal—the other is the "farewell rock," a species of stone composed of quartz, blended together by a silicious cement. Upon this rock repose the whole of the coal and iron stone "measures." The bricks are used for lining the interior of the blast furnaces down to "the hearth," or receptacle of the fluid iron, which is always constructed of the stone. Experiments on bricks made of this fire clay have satisfactorily shown that its capacity of resisting heat is fully equal to that of the better known, and more generally used, fire bricks of Stourbridge. The manufacture of fire bricks at these works is exclusively carried on by women, and a more humiliating and ungenial occupation for the sex is hardly to be found through the entire range of our industrial economy.

For the Journal of the Franklin Institute.

Explosion of a Locomotive on the Chartres Railroad, France.

The numerous explosions of steam engines, stationary and locomotive, which have recently occurred, and the very fatal effects of some of them, have strongly attracted the public attention for the moment, and it is hoped may convince the community of the necessity of requiring some precautions in the use of these valuable but dangerous motors.

The laws regulating the building and use of steam engines in France appear to be excellently devised for the purpose of proper restraint, and what is still better, and more uncommon upon our side of the ocean, are strictly enforced. Every explosion becomes the object of a report made by the Government Engineer of the Department to the Central Committee of Steam Engines, and if it be found that any of the precautions required by law have been omitted, the penalties are promptly and rigidly enforced. These reports are from time to time published in the "*Annales des Mines*," and furnish valuable documents for the study of those who are interested in this matter.

Such a report, upon an explosion of a locomotive on the Chartres Railway, is to be found in Vol. xvi., (4th Livraison for 1847, p. 81,) and we note it particularly, as reminding us of a feature which we noted in the explosion of the locomotive "Richmond" on the Reading Railroad, in 1844. (*Journ. Fr. Inst.*, 3d series, Vol. ix., p. 16.) In fact, M. Sentis, the Government Engineer who made the examination and report, states (p. 87) "that the bridge-bars were not so long as the top of the fire-box, but stopped 5 centimetres (1.97 in.) short of the edges of the upper plate. Now it was precisely at the ends of these bridge-bars that the rupture (of the crown of the fire-box) took place." This is assigned as the main cause of the explosion, by which we understand M. Sentis and the Central Committee to mean, merely that it determined the place of rupture. There was also reason to believe that the valve was screwed down, and the water line had been suffered to fall below the crown of the fire-box.

In a note, M. Sentis quotes a similar case, in which the line of fracture was determined by short bridge-bars, in the case of a locomotive made by Fairbairn, of Manchester, which exploded in 1845. In the case of the

"Richmond," the bridge-bars "terminated about $\frac{1}{4}$ in. short of the bend by which the crown is joined to the sides." This is a fault of construction against which our builders should be watchful, as we can scarcely conceive of a mistake more likely to lead to fatal results. ED.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, April 19th, 1850.

Thomas Fletcher, Vice President, in the chair.

George J. Zeigler, Recording Secretary, *pro tem*.

John F. Frazer, Treasurer.

The minutes of the last meeting were read and approved.

Letters were read from Mrs. Sarah Peters, respecting a School of Design for Females; from Wm. Peter, Esq., British Consul, respecting the Exhibition of the Works of all Nations, to be holden in London on May 1st, 1851; and from Mr. Angus N. Macpherson, accompanying his donation of Specimens of Ores from Valley Forge, Chester county, Penn.

Donations were received from The Statistical Society, and The Royal Astronomical Society, London; La Societé Polytechnique, and La Societé d'Encouragement pour l'Industrie Nationale, Paris; Hon. Jos. R. Chandler, U. S. Congress; The Mercantile Library Association of St. Louis, Mo.; W. Milnor Roberts, Esq., Marion, Ohio; Prof. John F. Frazer, Frederick Graff, Esq., Dr. Thomas S. Kirkbride, Samuel J. Reeves, Esq., and Angus N. Macpherson, Esq., of Philadelphia.

The periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement of receipts and payments for the month of March.

The Board of Managers and the Standing Committees reported their minutes.

The following Standing Committees reported their organization, by appointing their Chairmen, and fixing the time for holding their stated monthly meetings:

Committee on Models.—H. P. M. Birkenbine, Chairman, 2d Monday Evening.

Committee on Arts and Manufactures.—James C. Booth, Chairman, 2d Monday Evening.

Committee on Minerals and Geological Specimens.—Chas. M. Wetherill, Chairman, 2d Wednesday Evening.

New candidates for membership in the Institute (4) were proposed, and those proposed at the last meeting (3) were elected members of the Institute.

On motion, the letter from Mrs. Sarah Peters on the subject of a School of Design for Females was referred to the Board of Managers of the Institute, with power to take order.

On motion, a special vote of thanks was presented to A. N. Macpherson, Esq., for his valuable donation of Specimens of Lead and Copper Ore.

Dr. Wetherill submitted the results of several analyses made by him:—

I. Specimen of Graphite, from Bucks county, Pa. Lustre highly metallic, soft, crystallized in scales; specific gravity 2.29; an excellent conductor of electricity; burns with great difficulty before the blowpipe; burned very imperfectly in a reduction tube of Bohemian glass heated to redness in a current of oxygen, leaving a reddish-brown ash; with chlorate of potassa it burned completely. The qualitative analysis gave traces of iron; no lime. The carbon was determined by combustion with chromate of lead; 0.36025 grammes of the graphite gave 1.2595 carbonic acid and 0.004 water, corresponding to 95.35 per cent. carbon and 0.09 hydrogen, which latter falls below the errors of analysis.

II. Specimens of Cinnabar from California. No. 1.—Steel gray, crimson red streak; specific gravity 6.03. It contains sulphuret of mercury, silica, iron, and lime. 2.7057 grammes gave, on analysis, 1.6292 Hg., or 60.21 per cent.; 3.0477 grammes gave, on analysis, 1.8382 Hg., or 60.31 per cent. No. 2 was poorer, containing more flint; 2.0258 grammes gave 0.9250 Hg., or 45.66 per cent. These were both surface specimens.

III. Specimen of Lignite from Oregon, from the same locality as that the analysis of which was given by Prof. Frazer at the last meeting. The relative proportion of carbon to hydrogen was determined by combustion with chromate of lead. 0.471 grammes, dried at 100° C., gave 1.2595 CO₂ and 0.212 HO, corresponding to 72.93 per cent. carbon and 4.99 hydrogen. This is a perfect lignite, as is shown by its appearance, as also by its reaction with caustic potassa, which it colors brown. Heated alone in a test tube, it gives off sulphuretted hydrogen, a proof of the presence of sulphur.* The test for nitrogen, by potassium, gave affirmative results; the density is 1.3. The specimen corresponds in appearance and composition to a perfect lignite of Mont Meisner, as given by Regnault.

An improved Elevating Table was exhibited by the inventor, Mr. John T. Hammitt, of which the top may be raised by turning a crank, so as to convert it from a sitting into a standing table; or, by a similar arrangement, the top may be made flat or sloping. The tables are so constructed as to have a general application to the library and counting room.

Mr. Weygandt presented to the meeting an improved Galvanometer of very great delicacy, and a thermo-multiplier. In the latter he has succeeded in giving to the concave mirror of bell-metal a true parabolic curve.

Dr. Turnbull exhibited the Artificial Leech, an invention of M. Alexandre, of Paris. It consists of a scarifying tube of copper, which by a simple contrivance exhausts the air, and inflicts a wound resembling in shape that from the leech-bite, after which the blood is drawn by a similar tube of glass. It is, in fact, a tubular cupping apparatus, applicable to cases in which it would be impossible to apply other forms of that apparatus.

Dr. Rand brought forward a new explosive compound known as Napier's Gunpowder, though really the discovery of M. Hugeaud, assayer of the mint at Constantinople. It is composed of chlorate of potassa 2 parts, white sugar and ferrocyanide of potassium each 1 part. Its explosive power is stated at three times that of gunpowder. It explodes with great

* Analysis gives the proportion of sulphur 1.97.

rapidity although ungrained, and leaves a considerable corrosive residue. These properties render it unfit for use in fire arms, but it has been recommended for blasting, as being uninjured by becoming dampened if dried again. Its expense will prove an objection in this case. It does not readily explode by percussion. Not having as yet examined the products of explosion, he was unable to submit any probable rationale of its decomposition.

BIBLIOGRAPHICAL NOTICE.

Encyclopedia of Chemistry, Practical and Theoretical; Embracing its Application to the Arts, Metallurgy, Mineralogy, Geology, Medicine, and Pharmacy. By JAMES C. BOOTH, A. M., M. A. P. S., *Melter and Refiner in the U. S. Mint, Professor of Applied Chemistry in the Franklin Institute.* Assisted by CAMPBELL MORFIT, author of "*Applied Chemistry*" and "*Chemical Manipulations.*" Philadelphia: Henry C. Baird, successor to E. L. Carey, S. E. corner of Market and Fifth Sts. 1850.

The *Encyclopedia of Chemistry*, the publication of which was begun in numbers about three years ago, appears from the press of Mr. Baird in large 8vo., containing nearly 1000 pages of letter press, with several sheets of plates and wood cuts interspersed through the text. This is the first work of the kind, solely devoted to Chemistry, which has issued from the American press. The importance of the science of Chemistry is too generally appreciated to require more than the mere mention of it to be at once acknowledged. The wide range of the applications of Chemistry, and the almost infinite number of substances which the industry and zeal of modern chemists have brought to light, and evolved from their hidden and complicated combinations, render the arrangement of the various subjects in an alphabetical order, or in the form of an encyclopedia, one of great convenience, not only to those who have little familiarity with general Chemistry, but also to those who are no tyros in the science. The book supplies a want which has long been felt in the community of science and art, and has been supplied in such a manner as might have been expected from the reputation and experience of the author.

In reference to the specialities which are considered and treated in its pages, we are confident they will meet with a welcome from the artizan and manufacturer, and all who are concerned in the application of the principles which are discussed under their various heads. The extensive range embraced in this work renders it exceedingly valuable, not only to the student of practical and theoretical science, but also to the general reader as a work of reference.

The author has been ably assisted by Dr. Boyé of this city, Professor M'Culloh of Princeton, and Campbell Morfit, Chemist to the Ordnance Department. We have to congratulate Prof. Booth on the completion of the laborious task which he has undertaken, and on the highly satisfactory manner in which he has acquitted himself.

R.

JOURNAL
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THE FRANKLIN INSTITUTE
OF THE STATE OF PENNSYLVANIA

FOR THE
PROMOTION OF THE MECHANIC ARTS.

JUNE, 1850.

CIVIL ENGINEERING.

*Report of the Commissioners Appointed to Inquire into the Application of
Iron to Railway Structures.**

Continued from page 302.

ANALYSIS OF THE EVIDENCE RECEIVED BY THE COMMISSION.

Chemical Constituents of Iron.—Mr. Morries Stirling states that iron in its pure state is malleable, and that it is a combination of carbon with iron which produces cast iron. In addition to carbon, the cast iron in this country contains silica, lime, magnesia, alumina, occasionally some of the phosphates, and other admixtures; but iron made from magnetic ores is much purer. The strength of cast iron depends upon its freedom from impurities and upon the proportion of carbon it contains. The strongest cast iron contains about three per cent. of carbon, or, according to Mr. Charles May, when the carbon is in the smallest proportion that produces fluidity; a larger proportion tends to make the iron soft and weak, and a smaller hard and brittle. Mr. Glynn states that the strongest iron generally shows a clear grey or slightly mottled fracture, and he considers that that color indicates the combination of carbon with iron which produces the greatest strength. Mr. Morries Stirling states that, while color is admissible as a test of strength, it is not so of chemical constitution, for though dark-colored iron is usually weak, grey iron usually strong, and white iron usually brittle, yet black iron when chilled becomes white, although it must be supposed to contain the same quantity of carbon; hence, as a general rule, he concludes that color indicates the treatment to which iron has been subjected, and in some cases only the quantity of carbon.

* From the London Civil Engineer and Architect's Journal, for February, 1850.

Mr. Charles May coincides in considering the question of strength to be very much reducible to the quantity of carbon contained in the iron, as some of the tenderest iron skilfully treated will produce some of the strongest castings. Mr. Stephenson and Mr. Morris Stirling mention that the fluidity of the Berlin iron is due to the presence of arsenic, and the latter has observed that manganese mixed artificially with cast iron closes the grain, and is an improvement both to cast iron and steel. On wrought iron the effect of manganese is stated to be to give it the hot short property, whilst the cold short is produced by the presence of a small quantity of phosphorus; and the admixture of arsenic renders wrought iron hard and brittle.

Qualities and Mixtures of Iron.—The use of the *hot blast* in the manufacture of iron, it is stated by Mr. Glynn, does not of itself make iron worse or better; but by its means, materials, otherwise intractable, yielding alloys of metal, may be smelted, instead of ores yielding purer metal. Mr. Morris Stirling has not found any distinct difference between the chemical constituents of hot blast and cold blast iron, but apparently there is more carbon in the hot blast iron, and graphite is more commonly to be seen on the surface of No. 1 hot blast than on cold blast iron. Mr. Charles May considers that, by the use of the hot blast, the quantity of carbon which can be combined with the iron is increased. Mr. Hawkshaw and Mr. Fairbairn consider hot blast iron weaker than cold blast; the latter gentleman and Mr. Stephenson state that the use of the hot blast renders the metal very fluid; and Mr. Glynn says that its use is to produce in large quantities, and at a cheap rate, a soft fluid metal to be employed in light castings, and that in that respect he considers the invention to be of great public benefit, as enabling Scotch iron masters to use a new kind of ore, which, though of a weaker character, further experience may enable them to purify and improve.

At the same time the hot blast is essential for smelting the iron-stone from South Wales with anthracite coal, and the metal yielded is of the strongest character. Mr. Glynn and Mr. Stephenson mention that generally hot blast iron is dark grey in color and very fine in the crystal; but it appears to be universally agreed that there is no certain method of distinguishing hot blast from cold blast iron. Mr. Rastrick states that the temperature of the hot blast at the Gartsherrie furnaces was 680° Fahrenheit.

Mr. Stephenson does not attach much importance to the variation in strength of different sorts of iron, he considers that taking the average of irons generally throughout the country there is a proximity to an uniform standard. He concludes, from a series of experiments made by him for the High Level Bridge at Newcastle, that hot blast iron is less certain in its results than cold blast; that mixtures of cold blast are more uniform than those of hot blast; that mixtures of hot and cold blast give the best results; that simple samples do not run so solid as mixtures; that simple samples run too hard and sometimes too soft for practical purposes. Mr. Rastrick would prefer making girders of forge iron. Mr. Hawkshaw would use the Lowmoor iron. It is, however, generally admitted that mixing irons from different parts of the country produces the best castings, and since the object in mixing them is to obtain the proportion of carbon to iron

which gives the greatest strength combined with the required degree of fluidity, the exact proportion will be regulated by the appearance of the fracture of the several irons.

Mr. Morries Stirling states that No. 1 hot blast iron, mixed with No. 3 cold blast, will give the right proportion of carbon; but that if iron containing that proportion could be obtained at once from the blast furnace, it would be very superior. Mr. Charles May, however, observes, that the strength of cast iron depends upon the bulk into which it is to be run as well as upon its constituent parts, and that the art of the iron founder consists in his ability to produce the required amount of strength without any very definite knowledge upon the subject, either chemical or mechanical. Mr. Fox considers a very good mixture for girders to be cold blast Blaenavon two-thirds, and of hot blast Scotch, two sorts, from the black band and the red hæmatite ores, one-third. Mr. Grissell considers the use of old scrap iron to be of immense value, and would use Scotch iron, cold blast Welch, and old scrap. Mr. Fairbairn names as the best mixture independently of price—

Lowmoor, No. 3,	30 per cent.	
Blaina, or Yorkshire, No. 2,	25 “	
Shropshire, or Derbyshire, No. 3,	25 “	
Good Old Scrap,	20 “	= 100

Mr. Glynn names one-third strong iron from South Wales, and two-thirds of the more fluid metal of Yorkshire, Derbyshire, and Shropshire. Mr. C. Fox, Mr. Grissell, and Mr. Charles May, however, all concur in stating that mixtures of iron practically depend very much upon the commercial question of cost, and it is generally admitted that engineers have no guarantee that the mixture for which they may have stipulated in a contract shall be that used by the founder; hence Mr. Fox recommends that engineers, in contracting for a number of girders, should stipulate that they should not break with less than a certain weight, (leaving the mixture to the founder,) and cause one more than the required number to be cast; the engineer might then select any one to be broken, and if it broke with a less weight than had been agreed upon, the whole should be rejected. Mr. Glynn considers that the strongest castings are those cast from the air furnace in dry sand, and castings in loam are stronger than those in open sand. The metal is more dense and more free from impurity when cast upright. Mr. Fox and Mr. Fairbairn also prefer the air furnace. With respect to wrought iron, Mr. Morries Stirling considers the process adopted in its manufacture as capable of great improvement. Mr. E. Clarke states that wrought iron from the same maker is not always the same, and though there is not much difference in the ultimate strength of iron, that some qualities extend much more than others before breaking.

Proportion of Load to Breaking Weight in Girders.—There appears to be a considerable difference of opinion as to the proportion between the greatest load which a girder should be allowed to bear and the breaking weight. There are two conditions under which the weight may be applied, viz, first, when stationary, as in the case of water tanks, floors, &c.; second, when the weight moves so as to cause concussions and vibrations, as in railway bridges. In girders required for the first case, Mr. Fox and

Mr. T. Cubitt consider that the breaking weight should be three times the greatest load; Mr. P. W. Barlow four times; and Mr. Glynn would not make it less than five times the load.

In girders for railway bridges, Mr. Brunel states that he allows the load to be one-third or two-fifths of the breaking weight; but he considers that the rule he adopts for calculating the dimensions of his girders gives more than the usual strength. Mr. Grissell and Mr. Charles May consider one-third to be sufficient; Mr. Rastrick, Mr. P. W. Barlow, Mr. R. Stephenson, and Mr. Joseph Cubitt adopt one-sixth; Mr. Hawkshaw prefers one-seventh, except in cases where great care is exercised in the selection of materials and workmanship, when a smaller proportion would suffice; and Mr. Glynn considers that in structures exposed to concussion and vibration the ultimate strength of a girder should be ten times the greatest load.

Tests for Girders.—The general opinion as to the amount of test which should be applied to girders is, that the test should amount to twice the greatest load. Mr. Joseph Cubitt would employ three times the greatest load, or half the breaking weight; and Mr. Thomas Cubitt considers it safer to test a girder almost to the extent that would break it than not to prove it at all, as the testing of girders is the only means of discovering defects under the surface, and concealed from the eye. Mr. Brunel, however, thinks that a girder should not be tested with a weight exceeding the greatest load, as the object in testing is to ascertain the soundness of the casting, which may be judged of by its appearance under the load, and all risk of permanent injury should be carefully avoided. Mr. Rastrick, Mr. Glynn, and Mr. Joseph Cubitt recommend that blows be applied to cast iron girders when under the testing load. Mr. Hawkshaw and Mr. P. W. Barlow consider that, where actual weight is used, sufficient vibration is given to the beam by throwing the weight into the scales used in testing. It is stated that, for convenience sake, girders are usually tested by means of the hydraulic press; but Mr. Fairbairn, Mr. Locke, Mr. Brunel, Mr. Joseph Cubitt, and Mr. Fox prefer using actual weight, on account of the uncertainty as to the actual pressure the hydraulic press brings upon the girder; though the latter gentleman considers that all liability to error in the press is obviated by an improved construction which he has adopted. Mr. C. May states that, as girders are bought at the lowest possible price per ton, the manufacturer is compelled to adopt the most convenient and not the best mode for testing them, or ten times his profit would not pay him for the experiment.

Loads on the Bottom Flanch.—It is admitted that the mode of supporting the roadway on the bottom flanch of a girder causes torsion in the girder, though Mr. Rastrick and Mr. Locke do not consider that the strength is diminished by the pressure being so applied; and Mr. Stephenson does not think the torsion is of sufficient consequence to be noticed. In order to guard against any ill effects which might arise from the torsion, Mr. Locke fits in transverse pieces of timber between the two girders which support a line of rails, chocked perfectly tight, and he ties the bottom webs together with tension bars. Mr. Fairbairn and Mr. Hawkshaw consider it would be advantageous to alter the form of girders to enable them to withstand

the torsion. Mr. Fairbairn thinks the cross beams should either lay on the top flanch, or be suspended by hook bolts from the bottom flanch, in which opinion Mr. Glynn concurs. Mr. Hawkshaw would increase the top flanch of the girder, or would cast shoes or brackets on them to bring the bearing of the transverse joists close to the vertical web. Mr. P. W. Barlow has adopted a new form of bridge to avoid this torsion. Mr. W. H. Barlow observed considerable torsion in a girder without any top flanch. Mr. Fairbairn and Mr. Hawkshaw are of opinion that wooden cross-bearers for the roadway are liable to increase the amount of torsion by bending; but Mr. Stephenson and Mr. Brunel state that wood is desirable as a cushion to prevent the noise and vibration which iron on iron would be subject to.

Length for Simple Cast Iron Girders.—The use of simple cast iron girders in bridges appears to be limited only by the power to make sound castings, which arises chiefly from the difficulty of pouring the metal equally, and the inconvenience of handling large masses. Mr. Rastrick, however, would not put any limit to the length. Mr. Hawkshaw considers that they may safely be made more than 50 feet long; in which opinion Mr. Fox and Mr. Grissell concur, but name 60 feet as the limit. Mr. Glynn, Mr. Charles May, and Mr. Joseph Cubitt would make them from 40 to 50 feet. Mr. P. W. Barlow, Mr. Fairbairn, Mr. W. H. Barlow, and Mr. Stephenson state 40 feet as the limit; and Mr. Brunel names 35 feet, as he does not consider that sound castings can be ensured to a greater length. Mr. Fairbairn, however, mentions a girder in Holland 70 feet long cast in one piece.

Form for Simple Girders.—It appears to be universally admitted that the form resulting from Mr. Hodgkinson's experiments on the tension and compression of iron is that which gives the greatest strength; but the actual proportions are generally modified to suit the varying circumstances under which girders are employed. Mr. Stephenson sometimes makes the top flanch equal to the bottom one, but usually in the proportion of 3 : 5, partly to obviate any risk from unequal cooling of the materials, and partly from the necessity of having a large top flanch to bolt the flooring to. In preference to using a single girder, Mr. Stephenson recommends two girders to be bolted together, with a baulk of timber between, to which the rail is fixed. Mr. Hawkshaw, Mr. Fox, and Mr. Joseph Cubitt recommend that the top flanch be increased beyond the proportions given by Mr. Hodgkinson, in order to resist the lateral torsion. Mr. W. H. Barlow and Mr. Locke would use the arched form of girder whenever practicable, and the former gentleman says that straight girders have been in fashion, and consequently more used than practice actually required. Mr. Fox, in girders subject to dead weight only, would make the proportion of the top flanch to the bottom one as 1 : 6; but in railway bridges he recommends 1 : 4. Mr. Thomas Cubitt mentions that shoes or sockets, or any projections cast on girders, have a tendency to create flaws from causing the dirt to accumulate in those places, and he considers that the shape which will ensure a sound casting should be as much considered as the theoretical form of greatest strength.

Deflexion of Girders, and Effects of Permanent Loads and Change of Temperature.—It is considered that girders should not deflect more than from $\frac{1}{800}$ th to $\frac{1}{400}$ th of their length according to the form of the girder. It does not appear from the evidence that a weight equal to what a girder is constructed to carry, will, even if left on for any length of time, cause the deflexion of the girder to increase, unless subjected at the same time to considerable changes of temperature. Some experiments made by Mr. Fairbairn and Mr. Braidwood, show that iron loses a considerable proportion of its strength when heated to a temperature of more than 220° Fahr., and that it becomes uncertain below 32° . Mr. Clarke described the effect of the sun coming out and shining on the Conway tubular bridge for half an hour to have been to raise the tube vertically one inch; and he mentions that at night, from the low temperature, the deflexion was always greater than in the day-time. Mr. Fox instances the effect of frequent and great changes of temperature on some short girders, 6 feet long, which support the hoods of the forges in his workshops. In the day-time they are so warm that the hand can only just bear the heat; at night they become cold. The effect is to make the girders *swag*, and the swagging appears to be continually increasing. Some have attained as much as 3" deflexion in the centre; but their strength does not seem to be impaired.

The general impression of engineers appears to be that the deflexion caused by passing a weight at a high velocity over a girder is less than the deflexion which would be produced by the same weight at rest; and the increase observed, in many instances, is attributed by Mr. Locke, Mr. Stephenson, and Mr. Fox to the inequalities at the junction of the rails, or to the jerks of the engine. Mr. Hawkshaw, however, considers that the deflexions would be increased, and has given some examples of a manifest increase.

Mr. P. W. Barlow has observed a slight increase, and Mr. W. H. Barlow, in reference to this subject, cites a curious phenomenon which he observed on a timber viaduct, viz., that with a heavy goods train at a low velocity, a certain amount of deflexion was produced; but an express train passing immediately afterwards, with a much lighter engine, seemed to push the bridge like a wave before it.

Forms of Girders Beyond the Limits of Simple Cast Iron Girders.—The modes of construction which have been adopted by engineers for crossing spans beyond the limits of girders made of a single casting are very various; but the chief forms which have been adopted by engineers for girders of a compound nature in railway bridges may be classed under straight built girder of cast iron in separate pieces, bolted together; arched girders of cast iron; trussed girders; bow-string girders; wrought iron box and tubular girders.

The Built Girder is formed of separate castings fitted closely at the joints and bolted together, and is entirely dependent upon the bolts for support. Mr. Grissell instances one of 120 feet span, and states that he should have no hesitation in making one of 200 feet span; but the engineers generally seemed to consider that other modes of construction disposed the material

more advantageously. Mr. P. W. Bar'ow exhibited a new form of girder in separate castings, for moderate spans.

The Arched Girder.—The cast iron arch is a mode of construction which all engineers concur in approving of, when not limited by considerations of levels or of abutments. Mr. Locke states he would never willingly use cast iron in any other shape than that of an arch. Mr. W. H. Barlow has also adopted it where practicable.

The Trussed Girder is straight and of separate castings bolted together, assisted by wrought iron tension rods. The Dee Bridge girder was on this principle. Mr. Stephenson caused an experimental girder to be made, to exhibit the effect produced by the tension rods, adjusted as they were in the Dee Bridge girders, as well as the effect when adjusted to lie parallel with the bottom flanch and adjoining it; these experiments, in conjunction with some made by Mr. T. L. Gooch, show that the tension rods, though they do not, when acting at the angle, as they did in the Dee Bridge girders, produce the full effect; yet that they add considerably to the strength of the girder. Mr. Rastrick and Mr. Fairbairn object to the trussed girder on account of the different rates of expansion in cast and wrought iron. Mr. Stephenson and Mr. Wild propose to obviate this objection by putting the tension rod along the bottom flanch, and applying to it an initial strain of five or six tons per square inch, so as to cause the wrought iron to come into play as soon as any weight is applied to the girder. Mr. Fox approves of this arrangement, but he considers that a strain upon wrought iron tends to stretch the metal permanently, and that the tension rods would require to be tightened periodically, whilst Mr. Stephenson and Mr. Wild have concluded from their experiments, that with a less weight than ten tons per square inch, the elasticity of the metal is not affected. The measure of the strain upon the tension rods is the amount they are actually elongated by screwing up. As a combination of wrought and cast iron, Mr. P. W. Barlow has proposed to cast a bar of wrought iron in the bottom flanch of a girder, and not to make the bottom flanch so large. Mr. Locke, Mr. Stephenson, and Mr. C. May considered that the different rates of expansion of the two metals would be an objection to it. Mr. Brunel objects to the use of cast iron in long spans, and its combination with wrought iron, and prefers a framing of wrought iron and wood.

Bowstring Girder.—Mr. Hawkshaw, Mr. Glynn, Mr. W. H. Barlow, Mr. Locke, Mr. Fox, and Mr. Joseph Cubitt, are agreed in considering the bowstring form of girder, with a bow either of cast iron or wrought iron cells, and the tension rods of wrought iron, as free from any objections urged against other modes of combining wrought and cast iron. It is considered applicable under almost all circumstances, as the roadway can be suspended from the bow.

Box or Tubular Girders.—Mr. Fairbairn considers these girders the best for large spans, and from some experiments he made, considers them capable of resisting not only dead weight but also impact. Mr. Stephenson states that they are cheaper and more elastic than other forms for spans of

more than 40 feet, and he recommends that the top should be made of cast iron to resist compression. Mr. Glynn and Mr. Locke mention that they have been used for steam engines for some time, and consider the plan sound. Mr. Brunel looks upon the introduction of wrought iron into the construction of girders as the most important step that has been taken for some time in engineering; and he considers that, with ordinary care, and with the improvements which have been introduced in the mode of riveting, the joints made by riveting may be as permanent, and in every respect equal to the other parts of the structure, and he does not consider oxidation or vibration can affect them. With respect to riveting, Mr. Brunel considers that two plates could be riveted together so as to ensure their not breaking in any part contiguous to the rivets or joints, because the rivets should not act as pins or bolts, but as clamps, which, by pressing the plates together, produce an enormous friction. Mr. Clarke, however, who has made a good many experiments on the subject, does not appear to have obtained so close an union of the plates, as he states that they generally broke at the riveting. Mr. Hawkshaw has adopted wrought iron girders for large spans, because he considers the use of wrought iron more advisable than cast iron for large spans; the box form is adopted to produce lateral stiffness. Mr. Fox and Mr. Rastrick consider that a large structure, like the Menai Bridge, must be subject to sudden compression and extension from the changes of temperature.

Suspension Bridges.—Mr. Stephenson does not consider suspension bridges applicable to railways except to very small extent; and he states that he has been informed that an engine and train passing over one at Stockton, (which has since been replaced by a girder bridge,) pushed the bridge like a wave in front of it. Mr. Brunel states that, under very peculiar circumstances, he once proposed a suspension bridge himself. Mr. Brunel considers that the lattice bridge is advantageous only under circumstances which would prevent materials of more than a certain length being procured. Mr. Stephenson objects that the compression cannot be carried through them, and that the base through which the strain has to be carried is not sufficiently broad. It is stated, however, that Sir J. McNeill has remedied the want of power to resist compression by introducing a cast iron top.

Best Form for Bridges Independently of Expense.—Mr. Rastrick, Mr. Hawkshaw, Mr. Fox, Mr. P. W. Barlow, Mr. Glynn, Mr. Locke, Mr. Brunel, and Mr. Cubitt, agree in considering that the best form for iron bridges of large span is that of a cast iron arch. Mr. Grissell states that he considers a well made straight girder equally to be depended upon, but admits that the arch is the strongest form; and Mr. Fairbairn says that for spans beyond 70 or 80 feet he would prefer wrought iron tubular girders. Mr. Stephenson would use narrow wrought iron girders.

Action on Skew Bridges.—It does not appear that the deflexion of girders is sufficient to cause oscillation in engines passing over skew bridges, by causing one side to be deflected to the full amount before the other. But Mr. Stephenson mentions that when the road has been in bad order,

one wheel being on the solid angle of the brickwork, while the other was on the soft ballast, has caused considerable oscillation.

Effect of Impact and Vibration.—It is not admitted that the vibration caused by a railway train on bridges would injure the bolts or rivets of compound girders, if well made and strong in the first instance. Mr. Grissell gives them a large amount of surplus strength, as he thinks that when no greater strength of iron is put than is absolutely necessary, every jar must tend to loosen the joints, and he considers that vibration has much more effect on wrought iron than on cast iron. Mr. Fox states that he would not depend on a cast iron girder of separate pieces bolted together without strengthening it with a wrought iron tie-bar, but the use of wooden sleepers interposes a cushion which does away with the vibration. Mr. W. H. Barlow mentions that with light engines he found felt very useful in diminishing vibration, but that with the heavy weights now in use on the Midland line any interposing medium is crushed out. Mr. Stephenson attaches no great importance to vibration, and has laid iron girders on brick without interposing medium; and the fact of old cast iron mill-work having run for so long a time without breaking is cited by Mr. Hawkshaw, as an instance of the apparently small effect of vibration. Mr. W. H. Barlow considers that the irregularities which exist on the road from uneven joints, &c., in the rails, is a greater cause of danger than vibration, and he mentions that, to experiment on the impact, he caused the rails to be white-washed for a mile before the passage of a fast train of 12 carriages, and that the small imperfections in the joints caused spaces adjoining them of 5 inches in length to be left untouched by any of the wheels in the train.

Change of Internal Structure in Iron.—Mr. Rastrick mentions that, at the Pont-y-Pool Iron Works, a bar of wrought iron, suspended and continually struck by a hammer at the bottom, dropped in two after a length of time, but he knows of no instance of a change of structure on railways. Mr. Hawkshaw, though he has observed crystallization in broken rails and axles, has not traced it directly to vibration; he thinks mill-gearing and shafts would furnish good examples, though when they break the various circumstances under which the fractures have taken place should be observed. Mr. Grissell has observed that the vibration to which crane chains are exposed changes the iron from very beautiful malleable iron to the crystalline appearance of cast iron. He does not consider that cast iron is subject to the alteration of structure. Mr. Fox considers that vibration does produce a change in the internal structure of wrought iron, and instances that if the thread of a screw be cut in a wrought iron bar, and that the bar be broken across the tapped part, the fracture there will be found more crystalline than at the other part; he mentions the frequency with which shafts and mill gearing break, and states that cold-hammering the axles to give them a high polish changes their internal structure; but instead of remedying the injury by annealing, he recommends that they should be finished at a high temperature.

Mr. Grissell mentions that chains of cranes often break with a crystalline fracture, which he attributes to a change in the internal structure, but he does not consider the same effect is produced in cast iron. Mr. Fairbairn

states that repeatedly making a wrought iron bar red-hot, and plunging it into cold water, renders it crystalline, and that the fibrous texture may be restored by annealing; he considers that percussion renders the fibres more liable to break off short, but that without it is sufficient to cause a considerable increase of temperature, it does not produce any real internal change. Mr. Glynn considers that the structure both of wrought and cast iron is altered by a succession of blows, the wrought to a crystalline structure, the cast to larger crystals; he has observed this appearance particularly in axles, mill-shafts, toothed wheels, crowbars, and crane chains; the latter even when specially made of strong fibrous iron require to be annealed after about three years; the axles of tenders to which breaks have been applied he mentions as particularly subject to this change. He attributes the alteration to galvanic action, induced by the alloys from which iron is never entirely free, and considers that the action is increased by blows. He also mentions that brass wire, of copper and zinc, originally tough and fibrous, continually breaks off short with a crystalline fracture radiating in the form of a star, showing a change in the structure such as would have taken place if the metal had been melted and had crystallized in cooling; this effect is more rapidly produced in an atmosphere containing sulphuric acid. Mr. W. H. Barlow mentions having caused a piece of fibrous iron to be hammered for a long time by a blacksmith, and that he found the iron changed from a fibrous to a crystalline structure; but as axles do not undergo the same sort of hammering, he does not know whether the same effect takes place in them.

Mr. Stephenson considers the fact of an alteration of structure as highly improbable, and cites the connecting rod of an engine having vibrated 25,000,000 times, and yet being perfectly fibrous. In the cases of axles, the iron may not have been fibrous in the first instance, for though when a piece of iron is rolled from 1 foot in length to 20 feet it necessarily becomes fibrous, it does not necessarily become so when rolled from 1 foot in length to 6 feet. He says that in all the cases of change of structure which he has heard of, there has always been some important link wanting. Mr. Locke considers that concussion would alter the structure of iron, but would not offer an opinion as to whether the fracture of axles arose from that cause; he mentions that a great many axles broke when the crank axles were in use, but that since straight axles have been adopted fewer breakages have occurred. Mr. Brunel doubts the change of internal structure, and thinks the various appearances of different fractures result as much from the mode in which the iron has been broken as in any change in structure, and that change of temperature will also produce a variation in the fracture; that iron in a cold state shows a more crystalline fracture than the same iron warmed a little, and that wrought iron does not *actually* become crystalline and fibrous, but breaks either fibrous or crystalline according to the combination of circumstances under which it is broken, but with the combination required he is not acquainted; he cites the stratification and planes of cleavage of rocks, which may be broken with different fractures according to the mode of applying the blow. Mr. Brunel exhibited various specimens broken, some with a fibrous fracture by means of a slow heavy blow, and some with a crystalline fracture by means of a sharp short blow. Mr. Charles May cites the beam of a steam engine as

an instance of continued vibration not affecting iron, and mentions as an instance in favor of the change, the fact that a gun used in his works to break pig iron across, at last dropped in two as if it had been cut.

Greatest Weights on Railways.—Mr. Hawkshaw states that locomotive engines are the greatest weights which can come on railways, and reckons $1\frac{3}{4}$ tons per foot linear as the greatest weight for a single line of way. Mr. Fox, Mr. Fairbairn, and Mr. Brunel, mention $1\frac{1}{2}$ tons. Mr. W. H. Barlow states that on the Midland there are engines on four wheels weighing 32 tons exclusive of the tender, but that that weight is too great for the permanent way, and that the rails are crushed and flattened by it. Mr. Stephenson and Mr. Locke state, 1 ton per foot linear is the greatest weight which comes on a single line of rail.

On the Street Paving of the Metropolis, with an Account of a Peculiar System adopted at the London and North-Western Railway Station, Euston Square. By MR. W. TAYLOR.*

The paper commenced by directing attention to the importance of a good system of paving, in conjunction with a more perfect plan of sewage, for all large towns. The paving of the metropolis had too long been carried on under an antiquated and unscientific system, of using large masses of granite placed on insufficient substratum; the consequences of this were great noise, an imperfect foot-hold for the horses, danger of the constant fracture of the springs and axles from the jolting over an uneven surface, and great expense of repairs. The "macadamized" streets were manifest improvements on such a system, but the surface was not found capable of resisting the heavy traffic of the main thoroughfares of the city. The defects of the wood pavement so greatly exceeded the merits that it had been nearly abandoned.

Impressed with the disadvantages of the present system of paving, Mr. Taylor tried an experiment about ten years ago, by covering a surface subject to very heavy traffic,—and subsequently, about five years since, entirely paving the departure side of the Euston Station of the London and North-Western Railway in a peculiar manner. The system was on entirely new principles. The method employed was, after removing the subsoil to the depth of sixteen inches, to lay a thickness of four inches of strong gravel, equally and well rammed, then another layer of gravel mixed with a small quantity of chalk or hoggin, for the purpose of giving elasticity, the ramming being continued as before; a third coat, of the same materials, was then laid and rammed, a regular degree of convexity of surface being preserved. The stones used were Mount Sorrel granite, dressed and squared into regular masses of four inches deep, three inches thick, and four inches long; these stones were laid in a bed of fine sand one inch in thickness, equally spread over the surface of the substratum, and they were carefully placed, so that no stone should rock in its bed. The whole surface was then well driven down with wooden rammers, weighing fifty-five pounds each. The small size of the stones enabled them to be well ram-

* From the London Athenæum, for March, 1850.

med home, so that the surface of the pavement never sank, and the hardness and toughness of the material prevented the stones from being worn down by any traffic, however heavy.

It was stated that this system was found infinitely preferable to the employment of large stones, and the statement of cost was vastly in its favor, the price of the ordinary kind of granite paving, in London, being 18s. per superficial yard, and the maximum cost of the new or "Euston" pavement, including the substratum, was not 12s. per yard, and deducting the value of the old stones, not (in this latter case) claimed by the contractor, the net cost would only be 9s. per yard.

It was suggested that the different Paving Boards should make a trial in streets of small traffic, by lifting the large stones, and cutting them into small cubes or rectangular pieces of three inches in depth for the future pavement; so that a good field would be afforded for the practice of the paviors, which would enable them to be better qualified for the task of extending the system to the more important thoroughfares. By this means, too, a large surplus of stone would be accumulated for paving, and the refuse would be valuable for macadamizing the roads in the outskirts.—*Proc. Inst. Civ. Eng.*

*The Pneumato-Spheroidal Engine.**

The attention of the Continental engineers is again called to the pneumato-spheroidal engine of M. Testud de Beauregard. It will be remembered that this engine is constructed on the principle which has been so ably investigated by M. Boutigny, of employing water in the spheroidal state; this condition being induced by allowing it to drop into heated metal tubes. Although the water never acquires the boiling temperature, the vapor escaping from it has the high temperature of the metal with which it was in contact, and is therefore in the highest state of tension. An engine of this construction has been at work for some months in the atelier, 162, Faubourg Saint-Denis, and it is said to act exceedingly well, and to be very economical.

Opening of the Britannia Tubular Bridge.†

The opening of this magnificent structure came off on Tuesday, March 5th, at dawn, with the grandest success. At half-past 6 o'clock, A. M., three powerful engines, of from 50 to 60-horse power each, decorated with flags of all nations and union jacks, steamed up, and, harnessed together, started from the Bangor station, carrying Mr. Stephenson, who drove the first engine through the tube, and other gentlemen. At precisely 7 o'clock the adventurous convoy, progressing at a speed of seven miles an hour, was lost sight of in the recess of the vast iron corridor. Instead of being driven through with a despatch indicative of a desire on the part of those who manned it to get in and out with the utmost expedition, the locomotives were propelled at a slow and stately pace, with the view of boldly

* From the London Athenæum, for March, 1850. †Ibid.

proving, by means of a dead weight, the calibre of the bridge at every hazard. The total weight of the locomotives was 90 tons.

The appearance of the interior of the tube during the interesting experiment was of a novel and remarkable character. The pauses that occurred during the progress of the transit furnished an imposing view of the interior of the gigantic structure, which, as contrasted with that of a tunnel of similar length, was rendered comparatively cheerful by the recurrence at intervals of loopholes of light, which serve the three useful purposes of ventilating, lighting, and divesting the tube of steam from the passing engines. The locomotives were brought to a standstill in the centre of each of the great spans, without causing the slightest strain or deflexion. The first process, that of going through the tube and returning, occupied altogether 10 minutes.

The second experimental convoy that went through consisted of twenty-four heavily laden wagons, filled with huge blocks of Brymbo coal, in all, engines included, an aggregate weight of 300 tons. This was drawn deliberately through, at the rate of from eight to ten miles an hour, the steam working at quarter power. During the passage of this experimental train through the tube, a breathless silence prevailed that was almost solemn, until the train rushed out exultingly, and with colors flying, on the other side of the tube, when loud acclamations arose, followed at intervals by the rattle of artillery down the Straits. Upon the return, which occupied about seven minutes, similar demonstrations ensued; and during the progress of the train, those who stood upon its top to ascertain any possible vibration, reported they could detect no sensible deflexion.

After this, Mr. Stephenson and his staff steamed up to Plas Llanfair, Mr. Foster's seat, and partook of a handsome repast. Meantime the locomotives were passing up and down the interior of the tube without eliciting the slightest manifestation of strain. An ordeal stronger still was then resorted to; a train of 200 tons of coals was allowed to rest with all its weight, for two hours, in the centre of the Carmarthenshire tube; and at the end of the time, on the load being removed, it was found to have caused a deflexion of only four-tenths of an inch. It is remarkable that this amount of deflexion is not so much as one half-hour of sunshine would produce upon the structure; it being, moreover, calculated with confidence that the whole bridge might with safety, and without injury to itself, be deflected to the extent of 13 inches. These loads, it is most material to remember, are immensely more than the bridge will ever be called on to bear in the ordinary run of traffic; though the engineers are of opinion that it would support with ease, and without much show of deflexion, a dead weight on its centre of 1000 tons. Twelve miles an hour is the limit of speed at which Mr. Stephenson intends that trains shall at first go through, more particularly as there are sharp curves at the termini of the tube.

It being now nearly 12 o'clock, another testing train was prepared to be taken through the tube. It consisted of the three engines, the 200 tons of coal, and from 30 to 40 railway carriages, containing between 600 and 700 passengers, packed together as closely as figs in a basket, all so clamorous and eager to "go through the tube" that it became impossible to accommodate them. At length, obediently to a long wild whistle, the train, which was almost long enough to cover the extent of tube, glided slowly

into the interior, saluted by a loud burst of "Rule Britannia," from an array of Liverpool seamen up aloft in the towers at the entrance, on the front of which, cut deeply in the stone, were the words "Erected Anno Domini 1850: Robert Stephenson, Engineer." As the huge train trailed slowly through the tube successive salvos of artillery were fired at each end. This accomplished, the steam was got up, and the company assembled proceeded at the rate of 35 mile an hour, amid the magnificent scenery and snow-capped hills of Wales, to Holyhead, where they were received by all the principal townspeople, and with salutes from the steam ships in the harbor.

The effect of the recent hurricane on the calibre of the tube has proved that its lateral surface strength is sufficient, and far more than sufficient, to resist the strongest wind. It is calculated that, taking the force of the wind at 50 lbs. on the square foot—an excessive supposition—the resistance offered by the bridge would be $300 \text{ tons} \times 2 = 600$, which is not two-thirds of its own weight. The wind going at 80 miles an hour, the rush of a hurricane would only press in the ratio of 128 tons on the side. It is intended, when both tubes are up, to brace them together with stays, so as to counteract any possible oscillation.—*London Times*.

AMERICAN PATENTS.

List of American Patents which issued in January, 1850, with Exemplifications by
CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

1. For an *Improvement in Pen and Pencil Cases*; Albert G. Bagley, City of New York, January 1.

The patentee says,—“The nature of my invention consists in providing an auxiliary interior tube, to lock with the sliding outside tube, to make a stronger case than those heretofore used, and to make the two outside tubes fit closer together; making a neater joint, and a longer pen case, when drawn out.”

Claim.—"I claim the auxiliary interior tube, in combination with the two outside tubes, in the manner substantially as described, and for the purpose set forth."

2. For *Improvements in Combining Grinding and Bolting Machines*; James M. Clark, Lancaster, Lancaster county, Pennsylvania, January 1.

The patentee says,—“My invention consists in the combination of a grinding mill and bolter, all on one shaft, and grinding and bolting flour at a single operation.”

Claim.—"What I claim as my invention, is the combination of an adjustable grinding mill with an adjustable bolting machine, both worked on one shaft, and adapted to each other so that both or either can be adjusted independent of the other, substantially in the manner and for the purposes above made known."

3. For an *Improvement in Instruments for Paring Horses' Hoofs*; Ashley Crafts and Ebenezer Weeks, Auburn, Geauga county, Ohio, January 1.

Claim.—"What we claim as our invention, is the combination of the gripe, arm, and knife, whether made with or without the adjustive plates and joint-pin, or in any way substantially the same, and of any suitable size and material."

4. For an *Improvement in Hemp Brakes*; Jonathan Crane and F. H. Hamilton, Schenectady, New York, January 1.

- *Claim*.—"What we claim as our invention, is the combination of the revolving rollers

with the swords or beaters, arranged and operating substantially in the manner herein described."

5. For an *Improvement in Coal Grates*; Chauncey O. Greene, West Troy, Albany county, New York, January 1.

Claim.—"What I claim as my invention, is the formation of a revolving cylinder grate by placing circular grate bars or flanches around a hollow cylinder, a draft of cold air being passed through the said hollow cylinder for the purpose of cooling the same, at the same time making it answer the purpose of a hot air chamber, substantially as described."

6. For *Improvements in Operating Shuttle-Boxes in Looms*; Alfred Jenks, Bridesburgh, Philadelphia county, assignee of Robert B. Goodyear, Philadelphia, and Benjamin Hirst, Manayunk, Philadelphia county, Pennsylvania, January 1.

The patentees say,—"Our invention consists, first, of a sliding block of cams, arranged and operated in the manner herein set forth, for shifting a series of shuttle-boxes containing shuttles with filling of different shades or colors; and second, in a device by which the loom stops itself whenever the shuttle does not arrive in its proper box at the proper time."

Claim.—"What we claim as new, is shifting a series of shuttle-boxes, substantially as herein set forth, by means of a corresponding series of cams, acting through levers, cords, or other means, severally brought into action at the required intervals, by the pattern wheel face cam and spring, or other equivalent devices; the whole arranged and operated substantially as described."

7. For *Improvements in Hemp Scutchers*; F. H. Hamilton and Thomas Bullock, Schenectady, New York, January 1.

The patentees say,—"The nature of our invention consists in making a circular head or back upon a horizontal shaft, upon which head or back we place the knives or scrapers in an angular position, and also tangentially from the head or circle drawn around the centre to the periphery, by which arrangement and combination we obtain the beneficial results hereinafter named and described."

Claim.—"What we claim as our invention, is the combination of the circular back or head with the inclined knives or scrapers, and the hub and rest, substantially as herein mentioned."

8. For an *Improvement in Connexions of Brakes with Cars*; John Kimball and Harvey Rice, Concord, Merrimack county, New Hampshire, January 1.

The patentees say,—"This invention consists in placing a tube, coating, or lining of India rubber, or other elastic substance, around a link or pin passing through a box or casing which contains the brake or other portion of machinery, and enclosing and confining such rubber or other substance by such box or casing, so as to hold the rubber in a permanent position, except so far as its elasticity is affected by the pressure or motion of the link or pin, whenever the brake or other portion of machinery is used.

"Also, constructing such brake or other portion of machinery with a second box or casing enclosing the outer end of the link, one end of which box is secured by a bolt or bolts to the brake or other portion of machinery, thereby forming a double joint to the brake, and enabling the brake to be applied so as to adapt itself to the wheel at all times with the same force through the whole arc of the brake, and not more at the top of the brake than at the bottom."

Claim.—"What we claim as our invention, is the enclosure of the said link or pin in a tube, coating, or lining of India rubber, or other elastic substance, and securing said rubber in a box or casing, so as to confine the same permanently in such a way as to allow the action of the brake or other machinery, without wear or friction, rattling or noise."

9. For an *Improvement in Washing Machines*; Ransom Marean, Lawrenceville, Tioga county, Pennsylvania, January 1.

The patentee says,—"My invention consists of a moving bed of rolls, arranged in such manner that they are turned with different velocities; the clothes being rubbed and turned by the rolls, and squeezed between them and a compressor, much in the same manner as in ordinary hand washing."

Claim.—"What I claim as my invention, is the combination of a bed of rollers, moving at different velocities, with a compressor, for the purpose of washing, rinsing, and wringing clothes, substantially as set forth."

10. For an *Improved Blind and Shutter Mover and Fastener*; William Maguire, Cincinnati, Ohio, January 1.

The patentee says,—“The nature of my invention consists in constructing the usual window blind opener and fastener, where a cog wheel on the hinge is operated by a similar wheel on a shaft passing through the window frame to the inside of the house, so that, by means of a finger on the last mentioned wheel, a gravitating catch, placed at a proper position on the outer face of the blind for resisting the wind or other agency, can be positively fastened and unfastened, the finger being operated by the handle that turns the shaft inside of the house, the handle, and a spring catch inserted therein, comprising at the same time within themselves, and in connexion with a curved rack, a strong yet neat mode of fixing the position of the blind when the gravitating catch is not called into play, the end of the handle being made to clasp the edge of the rack forward into one or other of the notches on the face of the curved rack.”

Claim.—“What I claim as new, is the combination of the finger and wheels with the gravitating catch, its recess, and spring and hook, for moving, fastening, and unfastening the blind.”

11. For *Improvements in the Wheel and Axle Stump Extractor*; John Rogers, Orleans county, Vermont, January 1.

The patentee says,—“The nature of my invention consists in an arrangement, or peculiar manner of arranging, of the axletree of the wheels with respect to that of the windlass barrel, the object of the same being to relieve the journals of the axletree of the wheels from much, if not all, the strain to which they are usually subjected when the machine is used, and they are placed or arranged in line with the axis of the barrel or windlass, as they have heretofore been disposed; it being understood that in such machines as hereinbefore constructed, instead of the windlass barrel having an axletree entirely separate and distinct from that of the wheels, but one axle was generally employed, and that common to both barrel and wheels.”

Claim.—“What I claim as my invention, is the arrangement and combination of the axle or journals of the wheels and the axle or journals of the windlass barrel of a stump extracting machine, substantially in the manner, and with respect to the bed-frame and other parts of the machine, as hereinbefore specified; the same being for the purpose essentially as above set forth.”

12. For an *Improvement in Machinery for Making Cotton Cordage*; Franklin Slaughter and David Perry, Fredericksburgh, Spotsylvania county, Virginia, January 1.

Claim.—“What we claim as our invention, is, 1st, the improved form of the nipper-heads, when the nippers are combined therewith by means of the steadying pins, projecting from the inner edge of the nippers into guiding holes in the nipper-heads, and by suitable actuating springs, or their equivalents, substantially as described; by means of which the nippers are prevented from becoming clogged in their movements, and from pressing against the slivers, by the accumulation of trashy matter about them.

“2d, In combination with the planetary motion of the series of flyers that receive and twist the cotton slivers, and lay the threads formed thereby into a cord or rope, as described, we claim the independently-moving and self-adjusting compressing forming block, for giving a round and perfect form to the cord or rope, after its component threads have been laid together, substantially in the manner herein set forth.”

13. For an *Improvement in Branding Tools*; Lewis Stark, Chicopee, Hampden county, Massachusetts, January 1.

Claim.—“I claim as my invention, the combination of the inner with the outer shell, substantially in the manner described, as applied to the branding tool.”

14. For an *Improvement in Printers' Type Cases*; John Bell, Harlaem, New York county, New York, January 8.

The patentee says,—“My improvement consists in grooving the bottoms of cases for the reception of the lower parts of the partitions, and glueing these in them; thus giving each recess a tight bottom, one always in contact with it, rendering the entire case more compact and durable, and effectually preventing the escape of the thinnest leads or letters from their places.”

Claim.—“I confine my claim to grooving the bottoms of type cases for the reception of

the lower edges of the partitions, and to securing these in them by glue, in the manner herein set forth, or of modes substantially the same."

15. For *Improvements in Engines Operated by Steam and Water*; James Black, Philadelphia, Pennsylvania, January 8; anté dated November 19, 1849.

Claim.—"What I claim as my invention, is the manner of combining steam and air for the purpose of giving motive power to the wheel, consisting in a jet of the former being thrown from the nozzle of the pipe C, into the pipe F, simultaneously introducing therein a quantity of the latter, which together are discharged through the lower end of said pipe F into the buckets of the wheel, and, displacing the water therein, causing said wheel to revolve, in combination with G, through which the hot air is drawn from the top of the box or reservoir into the pipe F, and re-introduced with the steam into the box at its bottom, thus using it repeatedly over again. The apparatus by means of which the above is accomplished is constructed and arranged substantially in the manner described."

16. For an *Improvement in Grain Drills*; William Bullock, Philadelphia, Pennsylvania, January 8; anté dated October 29, 1849.

The patentee says,—"The nature of my invention consists in its self-regulating principles, by which it clears the teeth from straw and other fibrous substances, and by which each tooth is made to rise and fall with the surface of the ground, and by which principles the simple action of the team, in hauling the drill, will allow any of the teeth to pass over any permanent obstructions which may be concealed under the ground, and bring the said teeth to their proper places immediately on their passing the said obstructions."

Claim.—"What I claim as new, is, 1st, the rollers which serve to clear the teeth from rubbish and govern the depth of the teeth.

"2d, The spring, in combination with the sheaves and teeth, by which arrangement the whole or a part of the teeth can be held by a spring of the same power and range of movement that it would require for a single tooth.

"3d, The movable bar to which the team is attached, in combination with the mode of hanging the teeth by means of sheaves or other similar device, by which arrangement the teeth will pass over obstructions, in which the action of the team in hauling the drill or cultivator will bring the teeth forward to their proper places as soon as they pass over the obstructions; and

"4th, 'The feeding band, substantially in the manner and for the purpose set forth."

17. For an *Improvement in Cultivators*; Ashley Crafts and Ebenezer Weeks, Auburn, Geauga county, Ohio, January 8.

Claim.—"What we claim, is the combination of the levers, roller, and driving wheel, in the manner and for the purpose set forth."

18. For an *Improvement in Cotton Gins*; John Du Bois, Greensboro', Greene county, Alabama, January 8.

The patentee says,—"The nature of my invention consists in providing an auxiliary set of ribs, between which the saws pass twice after passing through the ribs in the roll-box, to separate motes, &c., from the cotton in a separate chamber from that in which the seeds are separated from the cotton."

Claim.—"I claim the back ribs in combination with the front ribs, they (the back ribs) being constructed with a horn or projection each, behind which they curve downwards, to allow the saws to pass twice between the ribs, to remove the motes and other impurities, in the manner substantially as described."

19. For an *Improvement in Car Wheels*; George W. Eddy, Waterford, Saratoga county, New York, January 8.

The patentee says,—"The principle or character of my invention consists in combining with a cast iron solid hub and chilled cast iron rim, connected by a plate or plates, either cast in one substance with the hub and rim, or otherwise secured thereto, a set or sets of metal bars or spokes, secured in place either by casting the hub and rim thereon, or otherwise secured to them, for the purpose of giving additional strength to the wheel, and preventing the hub from separating from the rim when the plate or plates break, and thereby avoiding many of the disasters so frequent on railroads."

Claim.—"What I claim as my invention in railroad car wheels, is the combination of the rods which connect the hub and rim with the plate or plates, which also unite the hub and rim, substantially as herein described, whereby the plate or plates are protected against fracture from any sudden jar, and the hub prevented from being separated from the rim should the plate or plates break, as described."

20. For an *Improvement in Smut Machines*; Joseph G. Goshon, Shirleysburgh, Huntingdon county, Pennsylvania, January 8.

Claim.—"What I claim as my invention, is constructing the shoe (having the perforated plate for separating large extraneous matter from the grain) with a screen for separating the cockle and cheat from the grain, and an imperforated plate and spout for conducting the same to the outside of the machine, as described."

21. For an *Improvement in Curing Tobacco Stems*; Thomas Hoyt, City of New York, January 8.

Claim.—"What I claim as my invention, is the process of curing stems or other parts of tobacco with charcoal, by combining or mixing the two together, substantially in the manner and for the purpose set forth."

22. For an *Improved Ore Washer*; William M. Hughes, Fayette, Howard county, Missouri, January 8.

Claim.—"What I claim as my invention, is separating substances differing in specific gravity, or washing metallic ores, by means of oblique currents of water, and a horizontal one passing over the same in a reverse direction, substantially in the manner described; the oblique currents being produced by inclined surfaces or their equivalents."

23. For a *Method of Counterbalancing Sash by Means of a Heavy Weight*; Wm. Maguire, Cincinnati, Ohio, January 8.

The patentee says,—"The nature of my invention consists in attaching to each side of the sash a metallic rack into which a pinion wheel works, the pinion being placed within the window frame at about the height that allows it to catch in the teeth of the rack on the sash when the sash is flush down. Back of said pinion, and within the window frame, another rack works also into the pinion, the said rack being the exact length of the rack on the sash, and, in weight, half the weight of the sash."

Claim.—"What I claim as new, is counterbalancing the sash (and consequently enabling it to be suspended at any desired point) by means of metallic racks within the window frame, these racks being operated by pinions rotating on fixed shafts within the window frame, and these pinions being driven by other racks attached to the sides of the sashes throughout the entire length; the whole being constructed and arranged in the manner and for the purpose set forth."

24. For an *Improvement in Connecting Cutters to Shafts of Boring Instruments*; Lewis W. Miller, Mesopotamia, Trumbull county, Ohio, January 8.

Claim.—"What I claim as new, is the fastening by which the knives are affixed to the mandril, being a keyed ring to sustain the shank of the knives firmly in adjusting slots in the mandril, substantially as is above described."

25. For an *Improvement in Coating Iron with Copper or its Alloy*; Ebenezer G. Pomeroy, St. Louis, Missouri, January 8; anté dated July 9, 1849.

Claim.—"What I claim as my invention or discovery, is, 1st, the before described process of coating and impregnating iron, in all useful shapes and forms, with copper or any alloy of which copper forms a part; the said process consisting of cleansing with sulphuric acid, defending the cleansed surface with a coating of clay or other aluminous earth, drying the same, and then plunging the article thus coated into melted copper or some alloy of that metal.

"2d, I also claim the use of the clay paste to protect the metal from oxidating, during the process of alloying or coating the metal plates or pieces of iron, as set forth."

26. For an *Improvement in Churns*; Z. C. Robbins, St. Louis, Missouri, January 8.

Claim.—"What I claim as my invention, is the placing the inner surfaces of the series of

outer blades in positions tangential, or nearly so, to their circle of rotation, when they are combined with the inclined inner series of blades, substantially in the manner and for the purpose as set forth."

27. For *Improvements in Machinery for Making Cotton Cordage*; Franklin Slaughter and David Perry, Fredericksburg, Spotsylvania county, Virginia, January 8.

Claim.—"What we claim as our invention, is constructing the nipper springs of parallel bars, (one or both of which may be made elastic,) having series of holes or slots formed in them for the reception of the connecting and adjusting screw bolts, for the purpose of enabling us to cause the several nippers to press with the same amount of power and elasticity upon the slivers during their passage through the nipper heads, and also to vary the elasticity of the springs as circumstances may require, substantially as set forth."

28. For an *Improvement in Alloys for Points of Lightning Rods*; James Spratt, Cincinnati, Ohio, January 8.

The patentee says,—"The nature of my invention consists in forming an alloy of the metals, &c., in the following proportions, namely: 1 fuse together, 60 lbs. of English block tin, 5 lbs. of oxide of tin, 14 lbs. of antimony, 14 oz. of bismuth, 8 oz. of refined silver, 2 oz. of platinum, and as much silex as the metals will take up."

Claim.—"What I claim as my invention, is the formation of an alloy composed of English block tin, oxide of tin, antimony, bismuth, refined silver, platinum, and silex, in proportions as shown in the above specification, and for the purposes of being manufactured into lightning rod points."

29. For *Improvements in Machinery for Dressing Shingles*; Augustus Welch and Robert Walker, Bennington, Indiana, January 8.

The patentees say,—"The nature of our invention consists in so arranging the several parts of the machine that the bolt shall be riven, and the slab shaved on both sides at once, and delivered in a finished state."

Claim.—"What we claim as new, is, 1st, the combination of two planes, guided and moving to and fro in the straight converging grooves, with the spring plates in front of the plane-irons, for holding the slab, and those behind the plane-irons, for discharging the finished shingle from the machine; the whole being arranged and operating as set forth."

30. For an *Improvement in Machines for Cutting Shingles*; William Wood, Westport, Fairfield county, Connecticut, January 8.

The patentee says,—"The nature of this invention consists in securing the block of wood, from which the shingles are to be cut, to a vibrating carriage, arranged on suitable ways immediately in front of an inclined sliding frame containing a knife, and causing said carriage, with the block, to be drawn toward the knife, and vibrated at each up and down movement of the knife, by means of springs, notched bar, cams, and other appendages, in such a manner as to cause the carriage to vibrate and adjust the wood in such relation to the knife as to cut a tapered shingle at each downward movement of said knife."

Claim.—"What I claim as my invention, is the mode of moving the carriage sideways, and forcing the same towards the knife alternately, by means of the cams moving over the grooved shaft, by means of the bar and groove operating on the curved bars, cams, inclined bars, bolts arranged in the tubes, and pressed against the notches of the slotted bars by the spiral springs; spring L; the whole arranged and operated substantially in the manner and for the purpose set forth."

31. For an *Improvement in Mills for Sawing Irregular Forms*; Oliver Wright, Rochester, New York, January 8.

The patentee says,—"The nature of this invention consists in securing the saw in an inclined sliding frame, and arranging at the lower part of the same a vibrating table or platform, having segmental plates or bars secured to its lower surface by screws passing through slots formed in the same, the lower edges of which plates or bars rest on friction rollers turning in the frame of the machine, over which they are moved by a combination of bevel cog wheels, screw and other shafts, bands and pulleys, in such a manner as to cause the surface of the table or platform to assume any required angle with the line on which the saw moves, in order to give a corresponding bevel or mitre to the timber being sawed, and to admit of the

table being raised or lowered on the segmental plates or bars, to accommodate itself to any thickness of timber, so as to always keep the centre, of which the segmental plates or bars form the arcs of circles, on a line with the line upon which the saw moves, and midway between the upper and lower surfaces of the timber being sawed, to prevent the saw binding on its sides."

Claim.—"I claim the mode of raising and lowering the table or platform on the segmental plates or bars, for adapting the same to any thickness of timber to be cut, and keeping the middle of the timber, between its top and bottom, always in a line with the centre of which the segmental plates or bars form arcs of circles, through which (the centre) the saw passes, to prevent it from bending in the timber when sawing a curvilinear surface, by means of the ribs having slots near their ends, through which the screws, which enter the segmental plates or bars, pass in the manner herein described."

32. For an *Improvement in Mowing Machines*; Homer Adkins, Round Prairie, McDonough county, Illinois, January 15.

The patentee says,—“The nature of my invention consists, 1st, in providing one wheel of the wagon with cogs on its face, and combining it with a rocking shaft, on which are placed two cams, arranged in such a manner with the cogs of the master wheel that, when the said wheel revolves, one cog will act upon the cam on the rocking shaft at one side downwards, and another on the other side upwards, and this alternately to move the shaft in a rocking manner, to give a reciprocating motion to whatever machinery it be connected with.

“2d, I provide two sets of what may be termed cutters, consisting of two blades like two large saws, the same arranged one above the other, the lower made fast and the upper one attached to the rocking shaft connected with the master wheel of the wagon or cart, whereby the upper blade or set of cutters receives a reciprocating motion across the front of the cart below, cutting the grass, which is held snugly to receive the cut of the same, by the blade below, which, like fingers, grasp the grass for that purpose.”

Claim.—"I claim the master wheel, constructed with cogs on its face, in combination with the rocking shaft, constructed with two knobs or projections on it, to give a rocking motion to the said shaft, in the manner substantially as described."

33. For *Improvements in Gates for Fences*; Jesse Bailey, Leatherwood, Guernsey county, Ohio, January 15.

The patentee says,—“My invention consists in balancing the weight of the gate by the weight of panel of fence attached to the gate post.”

Claim.—"What I claim as my invention, is the method of balancing and adjusting gates by the panel of fence secured to the gate post, substantially as herein set forth."

34. For an *Improvement in Folding Bedsteads*; John Binder, Chelsea, Suffolk county, Massachusetts, January 15.

Claim.—"What I claim as my invention, is arranging said centre joint with the centre rivet below the other two, in combination with the curving of the adjacent edges of the parts of the side bars, so as to rest upon said centre rivet as described; and also the forming of the inner connecting bar with lateral projections or shoulders, which, when the bedstead is open, shall rest on the top of the cross-bars of the bedstead adjacent to the joints in the side bars of the same, all as set forth."

35. For an *Improvement in Dampers for Cleaning Stove Pipes, and Regulating the Draft in the Same*; Frederick Bleier, Pittsburgh, Pennsylvania, January 15.

Claim.—"What I claim as my invention, is the scraper, with the rods attached in such manner that it may be used for the purpose of cleaning the stove pipe, and also to act as a damper, as set forth."

36. For an *Improvement in Mills for Grinding*; Charles W. Brown, Boston, Massachusetts, January 15.

The patentee says,—“The first part of my invention consists in constituting the mill spindle one arm of a universal joint, the other arm of the said joint being pivoted to the runner, so that the runner has free play to adapt itself to the grinding surface of the stationary stone.

“The second part of my invention consists in employing a sliding tube between the bush

of the stationary stone and the spindle, the upper end of the said tube being fitted to the under surface of a collar on the spindle, and the lower end resting on a secondary bridge-tree which moves with the main bridge-tree, so that the tube shall move up and down with the spindle when the runner is adjusted, the lower or second bridge-tree being adjustable relatively to the main bridge-tree, that the two may be adjusted to the collar of the spindle, to prevent the passage of meal, &c., into the tube."

Claim.—"I claim the employment of a sliding adjustable tube within, and in combination with, the bush of the stationary stone and the spindle, for the purpose and in the manner substantially as described."

37. For an *Improvement in Brick Presses*; Charles Carnell, Kensington, Philadelphia county, Pennsylvania, January 15.

Claim.—"What I claim as new, is, 1st, the arrangement of levers B and C, by which arrangement the bearing of C is near the fulcrum of B, thereby giving the operator power to start the brick out of the mould, and by which arrangement the motion of the piston is increased by the bearing of C on B."

38. For an *Improvement in Files for Keeping Papers*; Edwin D. Dood, Cincinnati, Ohio, January 15.

Claim.—"What I claim therein as new, is the top, consisting of a stationary part for about half its length, and a lid hinged thereto for the remainder, in conjunction with the end lid and one or more side openings, substantially after the manner and for the purposes described, namely, that of combining with sufficient facility of reference, the greatest attainable despatch in the abstraction and insertion of papers, and moreover constituting, when closed, a secure and portable paper-holder."

39. For an *Improvement in Obstetrical Supporters*; William W. Finch, Jacob Blaisdell, and Leander Babbit, Essex county, New York, January 15.

The patentees say,—"The nature of our invention consists in combining and arranging certain appendages in such a manner that the female is enabled to apply the necessary pressure to the back by the compound simultaneous action of certain straps and braces connected with the spinal pad, by which much of the delay and danger of parturition is removed, and the intensity of the irritation and pain alleviated, without the agency of assistants; the whole acting in an easy and natural manner, creating the pressure through the effort of the upper and lower extremities of the female, thus hastening the termination of labor, and rendering the process of delivery much more safe and easy than by any other means or instruments heretofore used."

Claim.—"What we claim as new, is, 1st, the combination of the back supporter, feet straps, and adjustable shoulder braces, constructed as described, with the back pad, by which the female is enabled to apply the necessary pressure to the back by the simultaneous or alternate action of the shoulders and feet on the straps connected with the back pad, for relieving the labor and irritation of parturition without the assistance of any other person, as herein fully set forth."

40. For an *Improvement in Harvesting Machines*; John E. Heath, Warren, Trumbull county, Ohio, January 15.

The patentee says,—"My invention consists, first, in so arranging the cutters, which in my machine act as shear blades, that they can be set closer to each other as they wear; and second, in the peculiar motion given to them by which they are freed from the gum and dirt which accumulate upon their blades."

Claim.—"What I claim as my invention, is the method of cleansing the cutters, by giving them at suitable intervals a larger vibration than ordinary, substantially in the manner herein set forth, thus detaching the dirt and gum which accumulates upon them."

41. For a *Substitute for the Clevis*; John Howell, William D. Howell, and John Sipe, Clark county, Ohio, January 15.

The patentees say,—"The nature of our invention consists in having the upper part of the sheath or upright in the form of a crown-head, with a mortise through its whole length at right angles to the beam, which mortise has on each side, at the lower part, a groove running through it. Through this mortise, and through the beam, there passes a bolt, the head

of which is made to fit these grooves, and slide from side to side in the mortise. By this bolt there are two motions given to the beam, the one horizontal, the other perpendicular."

Claim.—"What we claim as our invention, is the combination of the crown-head and bolt with the upright, by which the plough is made to cut any width and depth desired, made substantially as herein described."

42. For an *Improvement in Cider Mills*; Samuel Jackson, Hamilton, Butler county, Ohio, January 15.

Claim.—"What I claim as my invention, is the particular combination of machinery used for the purpose of grinding and pressing fruits and juicy substances, viz., 1st, the cutter-drum, with its teeth *a* running into teeth *b*, in bed-mould, used to grind the fruit or juicy substance.

"2d, The strap made of felting, hair cloth, or other porous substance, used to carry the pommace or ground substance between the pressing drums, where it is pressed, and to strain the juice thus expressed.

"3d, The press-drums, used to press the juice from the pommace or ground substance.

"4th, The brush, used to remove the pommace or ground substance from the strap; all of the above being performed by one application of power and continued rotary motion."

43. For an *Improved Arrangement of the Valves of Hydraulic Engines*; Cornelius S. Van Wagoner, assignee of Wm. Kennish, Paterson, Passaic county, New Jersey, January 15.

Claim.—"What I claim as my invention, is arranging four register valves upon one spindle, in such a manner with reference to each other and their seats, so that the pressure upon any one of them shall be counterbalanced by the pressure upon some other of them, substantially in the manner herein described, for the purpose of regulating the induction and eduction to and from hydraulic engines."

44. For an *Improvement in Machinery for Tongueing and Grooving*; Robert Kittle, Dansville, Livingston county, New York, January 15.

The patentee says,—"My first improvement consists in the method of holding the plank firmly and securely upon the bed-plate while it is being operated upon by the planing cutters.

"My second improvement consists in the manner of arranging the tongueing and grooving cutters in their respective cutter-heads, in combination with the manner of operating them."

Claim.—"What I claim as my invention, is the placing the finishing, grooving, and tongueing cutters in the same heads with the primary grooving and tongueing cutters, and in reversed positions thereto, when the said cutter-heads are connected to operating cranks at one end, and are jointed to working levers at points between the primary grooving and tongueing cutters and the finishers, substantially as described, for the purpose of giving to the said cutters the movement and action set forth."

45. For an *Improvement in Buckles*; George R. Kelsey, Middletown, Middlesex county, Connecticut, January 15.

The patentee says,—"My method consists in making buckles entire from sheet metal of any kind suitable for making buckles."

Claim.—"What I claim as my improvement, is the mode of making buckles entire from a single piece of sheet metal, as described; the buckle opening and shutting by means of the spring given to it in the construction thereof, as aforesaid."

46. For an *Improved Door Lock*; William Maguire, Cincinnati, Ohio, January 15.

The patentee says,—"The nature of my invention consists in making the usual central protuberance, on the face of the knob, a spring trap for concealing the entrance for the key; and in making the spindle semi-cylindrical, and providing it with an annular bearing collar by which to hold on the knob, and providing it with a spring lever with a catch, which, when allowed to drop into a cavity made on the shank end of the knob, enables the knob to turn the spindle, or, in other words, prevents the knob rotating without turning the spindle; and providing it also with an inclined plane across its concave, by which the key is bent and guided towards the tumbler, the spindle thus forming a trough along which the key is pushed home.

"I also effect action on the bolt by means of a key capable of being straightened like a bar, and passed through the cylindrical opening in the knob, and along the cavity in the spindle,

(thus making but one opening into the lock,) and having its bit guided by the inclined plane on the spindle, and by another inclined plane on a disk in the lock, so as to introduce the bit into the notch in the compound tumbler and lever, and thus operate the bolt. I also effect the same by gearing within the body of the key, when I forego the use of one or both of the aforementioned guides.

"I also enable the key to operate the compound tumbler and lever, by previously compelling it to operate a bent lever, that, pressed towards the centre of the lock, lifts out of the way a spring tumbler, that controls the compound tumbler and lever, before the bit of the key enters the notch in the compound lever and tumbler, by lifting which the key retracts the bolt.

"I also prevent, by the foregoing arrangement, the retraction of the latch until the bolt is withdrawn.

"I also prevent the spring lever in the spindle from pressing the catch on said lever, (and effect this by means of the cam on the compound lever and tumbler,) until the bolt is retracted by the action of the key on the said compound lever and tumbler, so that, until the bolt is withdrawn, the knob rotates on the spindle."

Claim.—"What I claim as new, is, 1st, the combination of parts forming the key, constructed substantially as described, viz., the shaft with its slot, the slide with its slots, pins, rack, jaws, pinion, and bit with its teeth.

"2d, Constructing the knob with a central opening in its face closed by a spring disk, for the purpose of introducing there through the semi-cylindrical spindle with its annular shoulder a key, such as aforeclaimed, the shank of the knob being hollow for the purpose of receiving the same.

"3d, Arranging the bent lever that lifts the spring tumbler, so that the key must operate this lever before it can be inserted into the notch of the compound lever and tumbler for lifting the same, substantially in the manner described.

"4th, Constructing the compound lever and tumbler with the following characteristics, viz., so that its projection, in combination with the spring lever, prevents the bolt being forced back by pressure on its face when the bolt has been thrown forward; so that its projection, in combination with the projection on the latch, prevents the retraction of the same when the bolt is thrown forward; and so that its cam prevents the spring in the spindle from throwing the catch on the other end of the lever into the cavity on the face of the shank of the knob, so long as the bolt is thrown forward; the knob being thereby permitted to rotate on the spindle when the bolt is thrown forward, and to rotate with the spindle when, by the elevation of the compound lever and tumbler, the cam is carried below the lever; the compound lever and tumbler being thus combined with the spring tumbler, the bolt, the latch, the spindle, through its lever, and the knob, substantially in the manner and for the purposes described."

47. For an *Improvement in Circular Saw Mills*; Nicholas G. Norcross, Lowell, Massachusetts, January 15.

The patentee says,—“The nature of my invention consists in suspending the saw so that it can have a lateral vibration, and, when thrown out of line, will recover itself by the action of the driving belt, and the arrangement of the parts by which it is sustained, while at the same time the arbor has no lateral play in its boxes, and is made to fit close with shoulders, to prevent the oil from getting out while in operation, a matter of great importance when the motion is rapid, as in circular saws. This is effected by supporting the boxes in which the journals of the arbor run, upon standards to which said boxes are jointed, and which are themselves jointed to the foundation to which they are attached, so that the arbor is kept horizontal while it is allowed sufficient lateral play, the motion being in a curved line, and of course inclining downward, as the tops of the standards recede either way from a vertical position; to sustain this frame upright, the driving belt passes around the pulley on the arbor, up over a driving pulley above, and thus holds the frame up to the proper point, so that the saw is actually suspended by the belt, while it is kept steady and made to run properly by the frame below. By this arrangement, it will be seen that, while the slightest force will cause the arbor to deviate a little laterally, the constant tendency of the reacting agent is to bring it back to place again; by this means I am enabled to use a much thinner saw, and save material and power to a great degree.”

Claim.—"What I claim as my invention, is the application to circular saw frames of rocker-boxes and a swing-frame, as herein set forth, and suspending said frame in position by means of the driving belt, as above described, for the free and successful operation of the saw by the motion before mentioned."

48. For *Improvements in Spindles and Bobbins for Spinning*; Josiah G. Reed, Paterson, Passaic county, New Jersey, January 15.

Claim.—"What I claim as my invention, is making the life spindle or bobbin tube with two conical shoulders, substantially as described, in combination with the conical supports in which they run, one or both ends being adjustable, substantially as described.

"And finally, I claim the method, substantially as described, of driving the life spindle by means of a warve tube running on a dead spindle or a step, and embracing the lower end of the spindle, substantially as described."

49. For *Improvements in Winnowing Machines*; Abraham Straub, Milton, Northumberland county, Pennsylvania, January 15.

The patentee says,—"The most important of these improvements consists, first, in delivering the threshings or fowl grain to the blast in a direction the reverse of that in which the latter is moving; and second, in the peculiar method of distributing the blast generated by the fan."

Claim.—"What I claim as new, is the combination of a series of wind passages with the separating chamber, or other device for presenting the fowl grain to the action of the blast, and a fan for producing the blast, substantially as set forth."

50. For an *Improvement in Fastenings for Harness Hames*; Mortimer Taylor, of near Govanstown, Baltimore county, Maryland, assignee of Timothy Taylor, Purcell's Store, Loudon county, Virginia, January 15.

Claim.—"What I claim as my invention, is the combination of the hook lever and metallic plate secured to the lower end of one of the hames, for tightening the connecting strap attached to the lower end of the fellow hame, and for the purpose fully set forth, by which the hames may be connected and disconnected instantaneously by simply moving the hook lever in the arc of a circle; thus doing away with the troublesome and insecure fastening usually employed to connect the lower ends of hames."

51. For an *Improvement in Boring Machines*; Andrew Weikart, Greenford, Mahoning county, Ohio, January 15.

The patentee says,—"The nature of this invention consists in the construction of an implement or tool to be applied to the sides of beams of timber or other articles to be bored, said implement or tool being adjusted and clamped in the position desired to bore, the auger being at right angles to the face of the article being bored, and provided with a crank by which it is turned."

Claim.—"What I claim as my invention, is the combination of the jointed hook lever, pawl, notched plate, perforated flanché plate, crane, adjustable clamping block, with the adjustable stock, for adjusting and confining the bearings of the boring tool to the timber to be bored, in any desired position for boring holes in the timber at any required angle, without moving the timber, as described."

52. For an *Improvement in Trusses for Hernia*; William R. Battle, Powelton, Hancock county, Georgia, January 22.

Claim.—"What I claim as my invention, is the peculiar bend of the elliptical springs, as described, so as to cross them in front, and make the spring on one side support the opposite side, thereby giving a better pressure, with more ease and comfort to the wearer."

53. For a *Candle Mould Apparatus*; Herman Camp, Dunkirk, Chataque county, New York, January 22.

Claim.—"What I claim as my invention, is, 1st, the before described mode of making candles, by using the candles previously drawn from the moulds to hold the wicks for the succeeding candles, in the centres of the moulds, until the latter become sufficiently hard to sustain their own wicks, as described.

"2d, I claim the combination of the frames F K, recessed candle-holders, frames M M, and spools containing the continuous wicks, with the candle moulds, as described.

"3d, I claim the employment of the revolving platform, in combination with the hinged moulds constructed as aforesaid, arranged and operated in the manner and for the purpose as set forth.

"4th, I also claim the manner of raising the outer end of the spout of the vat, simultaneously with lowering the gate, for the purpose of stopping the dripping of the tallow whilst turning the frame of moulds, by combining the spout with the gate by the stirrup, roller, and lever, as described."

54. For an *Improvement in Gearing and Ungearing Seeding Apparatus*; David Eberly, Strasburg, Lancaster county, Pennsylvania, January 22.

Claim.—"What I claim as my invention, are the devices used herein for gearing and un-gearing the seeding apparatus, as described."

55. For an *Improvement in Bedstead Fastenings*; Matthew Elder, Mansfield, Richland county, Ohio, January 22.

The patentee says,—“My invention consists in giving such forms to the respective portions of the fasteners that they can be secured to the posts and rails of a bedstead, without making a mortise in either the one or the other.”

Claim.—"What I claim as my invention, is the giving the portion D of the fastener, that is secured to the ends of a rail, a tubular shape, and such a size that the portion thereof that projects from the end of a rail will embrace the fastening plate that is secured to the side of a post, when this arrangement is combined with the lugs projecting inwards from the extremity of D, and the notches and inclined planes on the plate A, substantially as set forth, by means of which the respective parts, A D, of the bedstead fastener can be secured to the posts and rails of a bedstead without forming a mortise in either one or the other."

56. For an *Improvement in the Concave of Corn Shellers*; Daniel Hoats, Milton, Northumberland county, Pennsylvania, January 22.

The patentee says,—“My invention consists, first, in making the concave in segments, hinged together and separately adjustable to different distances from the cylinder, to adapt the machine to the shelling of different kinds of corn; second, in so connecting the staves of both sides of the concave that, when adjusted, they shall be simultaneously moved an equal distance towards or from the cylinder, while at the same time their relative distance therefrom shall remain unchanged; and third, in combining with the grate or coarse screen for separating the grains of corn from the cobs, a series of punches or teeth, which, when the grate (which has a vertical oscillation) descends, will protrude through its meshes and free them from pieces of cobs and other obstructions; this arrangement ensures a constant and effectual separation of the corn and cobs.”

Claim.—"What I claim as my invention, is, 1st, connecting the opposite sides of the concave, substantially as herein described, whereby they may be moved simultaneously towards or from the cylinder without changing their relative distances from the same.

"2d, I claim the combination of the screen or grate with the punches for freeing its meshes from obstructions, substantially as described."

57. For an *Improvement in the Gridiron Slide Valve*; William W. Hubbard, Boston, Massachusetts, January 22.

Claim.—"What I claim as my invention, is the peculiar arrangement of the exhaust mortises or spaces in the sliding valve, between and around the inducing and educting passages through said valve, in combination with the elongated side slots or passages through the valve seat, leading to the exhaust chamber; the whole arrangement and operation being substantially as set forth."

58. For an *Improved Tuyere*; John Pawling, Morgantown, Berks county, Pennsylvania, January 22.

Claim.—"What I claim as new, is placing within a chamber, having numerous apertures at the top and a discharge valve at the bottom, an upright pipe open at both ends in the manner described, whereby a blast of the greatest intensity is delivered at the centre of the fire, and the vertical pipe may be readily freed from ashes, cinders, &c."

59. For an *Improvement in Portable Furnaces*; Merritt F. Porter, Charlemont, Franklin county, Massachusetts, January 22.

Claim.—"I claim the mode described of constructing my portable furnace, viz., with a di-

ving flue, open at the bottom so as to adapt it readily for use to the boiler holes of cooking stoves, in the manner specified."

60. For *Improvements in Spark Arresters*; James Radley and John W. Hunter, City of New York, January 22.

Claim.—"What we claim as our invention, is, 1st, the arranging of a series of chambers and channels between two conically shaped plates, the channels being so formed as to cause the products of combustion to impinge against that side of each of the dirt chambers which has the openings and caps, and thereby force the sparks, dirt, &c., into them in the manner described herein.

"We also claim the combination of the double conical cap or cover, for the formation of the second series of dirt chambers, with the pipe; the whole being combined and operating substantially as described."

61. For an *Improvement in Cases for Daguerreotype Pictures*; Ann F. Styles, Southbury, New Haven county, Connecticut, January 22.

The patentee says,—"The nature of my invention consists in the manufacture of a glass tube or case, in which the picture can be conveniently secured and seen through a magnifying lens, and at the same time protected from dust and interfering reflections from other objects."

Claim.—"What I claim as my invention, is the new manufacture of Daguerreotype cases, to wit, securing the picture in a glass tube or case provided with a magnifying lens, said tube being blackened on part of its inner surface, and admitting the light through another part to the plate, in the manner described."

62. For a *Chain and Flanch Apparatus for Opening and Closing Window Shutters*; Geo. Welsh, City of Washington, D. C., January 22.

Claim.—"What I claim as my invention, is the combination of links and a centre nut with a stationary curved flanch, exterior to the chain, to guide the links in such manner that they may be operated to turn the centre pulley or nut either by pushing or pulling, as herein described.

"I also claim, in combination with the sliding bar and links herein described, the arm on the centre nut, and the notch on the bar, for locking the shutter and taking the pressure off of the links when the bar is pushed in, and the shutter fastened as described."

63. For an *Improvement in Preparing Illuminating Gases*; Stephen White, Manchester, England, January 22; anté dated March 26, 1849.

The patentee says,—"My improvements in the manufacture of gas for illumination, and in apparatus employed therein, consist, 1st, in decomposing water by bringing it into contact, in the manner described, with charcoal, coke, or anthracite coal, and small thin plates of iron or small pieces of iron turnings or iron wires, at a high temperature, and thereby producing from such combination of materials, so treated, hydrogen gas, oxide of carbon gas, and carburetted hydrogen gas mixed, and afterwards in combining such compound gas with such carburetted hydrogen gas as may contain a large proportion of olefiant gas, produced by burning oil, or fat, or resin, or certain other substances hereinafter designated or described, in contact with heated materials, or with carburetted hydrogen produced from certain kinds of pit coal, so as to produce ultimately a compound gas, composed of hydrogen gas, oxide of carbon gas, and carburetted hydrogen gas mixed together; which compound gas is fitted for the purpose of illumination; and

"2d, My said invention consists, so far as it relates to the apparatus used, in certain particular apparatus hereinafter described, in reference to the plan or drawing hereto annexed."

Claim.—"I claim the method which I have described of producing hydrogen gas, oxide of carbon gas, and light carburetted hydrogen gas combined, freed, or nearly freed, from the presence of carbonic acid gas, by passing the gas evolved by the decomposition of water through a mass of materials consisting of charcoal, coke, or anthracite coal, in combination with thin iron plates, or iron wires, or iron turnings, heated to a high temperature; such compound gas, produced as aforesaid, being combined with heavy carburetted hydrogen gas produced by the decomposition of resin, oil, fat, or pit coal, or such other substances as herein before designated or described.

"I claim the use of small chains, or other similarly connected pieces of metal, as a means of presenting a large amount of iron surface, for the purpose of decomposing the resin, tar, oil, or fats, or other such substances herein before designated, such chains or other similarly

united pieces of metal being so arranged as to expose the vapors disengaged from the above mentioned substances to a multitude of small divided and heated surfaces."

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64. For an *Improvement in Seed Planters*; William B. Willis, Charlestown, Jefferson county, Virginia, January 22.

The patentee says,—“The essential improvement I have made in the machine relates to the construction and arrangement of the supporting and propelling wheels, which have their peripheries made with circular flanches, for the purpose of confining the seed to the peripheries of the wheels, and preventing the clods falling into the furrow made by the plough; pulling off any vegetation, such as roots of clover, straw, weeds, and other substances that may collect around the helve at its connexion with the shovel; gathering the fine earth to cover the seed, the peripheries of the wheels between the flanches serving as rollers to roll in the seed, and as bearings or fulcra, whilst bearing upon the handles at the rear end of the frame, to raise the fore end to turn the same to the right or to the left; rendering the machine perfectly manageable to the seed man, and enabling him to pass it over roots and through cloddy land, and having the capacity to cut its own way through the clods and roots.”

Claim.—“I only claim as my invention, the employment of the flanchèd, supporting, conveying, cleaning, and covering wheels, made as described, in combination with the rest of the machine, when made in the manner as set forth, for planting cotton and other seeds, and for other purposes.”

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65. For an *Improvement in Chucks for Boring and Mortising Machines*; Eli K. Wisell, Warren, Trumbull county, Ohio, January 22.

Claim.—“What I claim in the before described machine for mortising and tenoning as my invention, is the self-centring chuck, constructed substantially as set forth.”

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66. For an *Improvement in Atmospheric Churns*; John Young, West Galway, Fulton county, New York, January 22.

The patentee says,—“My invention consists in so constructing the dasher that, in its rotation, a large quantity of air is mingled with the milk; also in so constructing the churn tub that it effectually prevents the milk from splashing out of the churn, without interfering with the free action of the dasher.”

Claim.—“What I claim as my invention, is the combination of the inverted vessel and the disk on the stem of the dasher, to prevent the splashing out of the cream at the churn lid.”

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67. For an *Improvement in the Cotton Press*; A. D. Brown, Clinton, Jones county, Georgia, January 22.

The patentee says,—“The nature of my invention consists in providing an eccentric grooved pulley in combination with the pressure block, chain, and capstan, or gin; the whole being so combined that the eccentric pulley will move in such a manner that the velocity of the follower will be greatest when the least power for compressing is required, and the velocity of the follower least or less when the greatest amount of compressing force is required, with a uniform velocity of the lever of the capstan.”

Claim.—“I claim the pulley with its axis eccentric to its centre, in combination with the stock or follower of the pressure block, to compress cotton, &c., in the bale box, in the manner substantially as described.”

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68. For an *Improvement in Brick Presses*; John Butler, Buffalo, New York, January 29.

Claim.—“What I claim as my invention, is the combination of the crank, chain, and oscillating frame or carriage with the stationary bed of rollers; the whole being arranged and operated as described, for the purpose of supporting the moulds while being filled and pressed, striking the bricks and thus pushing the moulds out of the machine.”

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69. For an *Improvement in Wash Mixtures*; Stephen Crane, Charleston, South Carolina, January 29; *anté dated* January 19.

Claim.—“What I claim as my invention, is the above described compound, consisting of soap and ley, pearl ash, or soda, with ammonia and spirits of turpentine in the proportions substantially as set forth.”

70. For *Improvements in Utero-Vaginal Supporters*; Russel Caulkins, Sandusky City, Erie county, Ohio, January 29.

The patentee says,—“My invention consists in an instrument, the principal object of which is to enable females suffering under diseases known as prolapsus uteri and prolapsus vagina, to perform the necessary operations themselves without surgical aid. It is formed of a hollow tube of metal provided with a plunger, and also with two fingers or elevators for raising and replacing the uterus in its proper position after the tube has been inserted in the vagina.

It further consists in a capsule of gum elastic or other suitable material, which I place over the mouth of the tube, and force, distended by a piece of sponge, into the vagina, for the purpose of supporting the parts in their proper position, after having been raised by the elevators or fingers.”

Claim.—“What I claim as new, is, 1st, the combination of the elevating levers with the tube made of any material, and the mode of elevating and spreading the said elevating levers by the screw with its conical groove, as herein described, or in any way substantially the same.

“2d, I further claim the capsule, distended by the sponge, introduced through the tube for the purpose of supporting the uterus and vagina, in the manner set forth.”

71. For an *Improvement in Steam Boiler Furnaces*; English, Bennet, Frisbee & Crawford, assignees of Benjamin Crawford, Allegheny City, Allegheny county, Pennsylvania, January 29.

The patentee says,—“The nature of my invention consists, 1st, in heating the air required for the combustion of the fuel by the waste steam of the engine and the waste heat of the boiler flues, and then forcing it through the ash-pit into the fire by jets of steam which are mingled with the heated air, and likewise pass into the fire.

“2d, In the employment of self-revolving adjutages to discharge heated steam among the gases above the fuel in the grate, to co-operate with the hot air and steam forced through the ash-pit, in producing a perfect combustion, while the draft is maintained by jets of steam discharged through self-revolving adjutages in the smoke-pipes.”

Claim.—“What I claim as new, is the injection of whirling jets of highly heated steam among the gases evolved by the fuel on the grate, simultaneously with the forcing, by the steam blower, of a stream of mingled steam and heated air through the ash-pit into the fire; the air being heated substantially in the manner described by the exhaust steam and waste heat of the flues, and the draught of the flues being maintained by whirling jets of steam injected by the steam blower.”

72. For *Manufacturing Illuminating Gas from Bitumen*; Abraham Gesner, Halifax, Nova Scotia, January 29.

The patentee says,—“My discovery consists in having obtained from compact and fluid bitumen, asphaltum, chapapote, and mineral pitch, a new illuminating gas, which I denominate ‘Kerosene Gas.’ This gas differs from all other illuminating gases, for, as the bitumen contains no sulphur nor nitrogen, it is free from sulphuretted hydrogen, sulphurous acid, sulpho cyanogen, cyanogen, ammoniacal gas, and azote, and its relative quantities of carbon and hydrogen differ from those of the gases heretofore used for the purposes of illumination.”

Claim.—“What I claim as my invention, is the use of compact and fluid bitumen, asphaltum, chapapote, or mineral pitch, for the production of illuminating gas, to be substituted for other materials now in use. I also claim the retort, in combination with its movable case, in the manner and for the purposes set forth.”

73. For the *Preparation of Animal and other Manures*; Robert Hare, Philadelphia Pennsylvania, January 29.

The patentee says,—“My invention has for its object to produce a concentrated nitrogenous manure, as an artificial substitute for guano.”

Claim.—“What I claim as my invention, is the use of the mineral acids to act upon the soft parts of animals, or upon azotous vegetable matter, at temperatures varying according to circumstances, as herein set forth, for producing a concentrated manure.

“2d, I also claim the combination of the mineral acids with the different salts, as described, for modifying the anti-septic action of the acids on azotous materials, and for rendering them pulverulent, whether said azotous materials be animal or vegetable.

“3d, I also claim the combination of the mineral acids with wood tar, coal tar, or their equivalents, in the manner and for the purposes set forth.”

74. For an *Improvement in Apparatus for Heating Air by Hot Water*; Adrian Janes, City of New York, January 29.

The patentee says,—“My improvement consists in the peculiar construction, combination, and arrangement of a cluster of pipes for heating the surrounding air by the passage of hot water through them”

Claim.—“What I claim as new, is the peculiar construction and arrangement of the heating apparatus, by uniting the series of straight horizontal pipes into gangs by vertical end pieces, through which the circulating water is conveyed to all the pipes in the gang, in combination with the union boxes, the series of gangs forming the cluster being united at one end at the top of the end pieces by the union box, and at the opposite end at the bottom by a similar box, through which the water circulates to all the pipes, by means of a flow and return pipe connected with the boiler or heater at the furnace, as specified.”

75. For an *Improvement in Self-Waiting Tables*; Josiah Lamb, New London, Howard county, Indiana, January 29.

The patentee says,—“The nature of my invention consists in making a dumb waiter automatic or self-acting by means of suitable mechanism, so that great convenience and security from accident accrue to those partaking of meals at the table.”

Claim.—“What I claim as new, is arranging and operating a dumb waiter and fan so as to cause them to be self-acting, substantially in the manner and for the purpose described.”

76. For an *Expansion Gear for Puppet Valves*; Thomas McLaughlin, City of New York, January 29.

The patentee says,—“The nature of my invention consists in the producing of a more easy and safe cut-off for steam, by the combination attachment to the end of the rock-shaft of an arm or lever, having an angular quadrant-shaped opening in it of about 90°, more or less, and attached to the back of it, by means of a pin or bolt through its lower end, a quadrant-shaped plate, which has three holes pierced through it, (a greater or less number may be used if required,) for the purpose of proportioning the half, three-quarter, or full supply of steam. Into either of these holes, and through the angular opening in the arm, is attached one end of a connecting-rod, the other being bolted to a reciprocating plate connecting the ends of the two eccentric rods on the main shaft.”

Claim.—“What I claim is the use and employment of the connecting-rod, acted upon by two eccentrics, in combination with the reciprocating plate and arm, having an angular opening in it, and quadrant-shaped plate, or its mechanical equivalent, attached thereto, for the purpose of working puppet valves, in form and manner substantially as set forth.”

77. For a *Composition for the Manufacture of Sugar*; Louis de Saulles, New Orleans, Louisiana, assignee of L. H. F. Melsens, Louvain, Belgium, January 29; anté dated August 15, 1849.

The patentee says,—“My process for the extraction of the crystallizable sugar contained in the sugar cane, in the beet root, in the Indian corn, &c., by which it can be obtained without loss by either cold or hot, or by slow, or by rapid, evaporation at will, consists in the employment of the sulphite of lime dissolved in sulphurous acid, or generally in the employment of an acid sulphite of lime; the bisulphite is the combination that I prefer.”

Claim.—“That which I claim as my invention, is the mutisme or process of treating saccharine solutions by means of a solution of acid sulphite of lime, baryta, or strontia, as herein before described, applied to products containing sugar from the cane or other vegetables, that the crystallizable sugar may undergo no chemical change, either by the formation of secondary products, which destroy it, or by the generation of ferments, which modify or transform it.”

78. For an *Improvement in Driving Bobbins upon Spindles*; Oliver Pearl, Essex county, Massachusetts, January 29.

The patentee says,—“The particular feature of my invention, which relates to the friction button of the throstle spindle, consists in enlarging the diameter of it somewhat beyond that of the button in ordinary use, and in countersinking the upper surface of the same, so as to make it somewhat like a cup, as well as to leave on the upper side or surface of the button, and its outer edge, a narrow ring or annulus of surface on which a similar annulus of leather, or other proper friction material, is to be connected or otherwise properly fixed, the bobbin to

rest directly upon the top surface of such leather, as it generally does upon the disk or washer in common use."

Claim.—"What I claim as my invention, is the countersunk friction button, made substantially as specified, or, in other words, the combination of the friction annulus with the enclosed space for the reception of dirt and extraneous matter, when used in connexion with the spindle and bobbin, substantially as specified."

79. For an *Improvement in Gearing for Sugar Cane Mills*; Edward Phelps, Pittsburg, Pennsylvania, January 29.

The patentee says,—"The main purposes of my invention are to prevent the loading of the pivot of my main vertical roller shaft with the weight of the heavy cog wheel which drives it, while I secure a true horizontal motion of the wheel itself, and to allow for the vibratory motions of the said roller shaft, consequent on the irregularities of strain brought upon the rolls by the variable nature of the work which they have to perform."

Claim.—"What I claim as my invention, is the wheel revolving horizontally, in combination with the jointed or loose braces, connecting but not fastening it to the shaft, and with the fixed arm, the vertical grooves, and the friction rollers, acting together substantially in the manner and for the purposes herein set forth."

80. For a *Method of Sinking Hollow Piles, &c., by Exhausting the Air from the Interior of the Same*; Lawrence H. Potts, London, England, January 29; anté dated December 5, 1843.

The patentee says,—"My invention consists of using tubes of various sizes, forms, and materials, and causing the plastic or permeable matters, the silt or alluvial debris, to ascend by the pressure of the atmosphere commonly called suction. The tube, caisson, tower, or pile, then descends till it reaches a firm foundation, the silt, clay, mud, or other debris being removed from the interior of the tubular pile, which may be effected by the same means that stones and cement are inserted, and by chemical combination form a solid rock."

Claim.—"What I claim as new, consists in the attenuation of the air approaching to, or forming a vacuum in, the interior of a hollow pile, tube, caisson, shaft, or other structure by any of the known means of producing what is termed suction, by which the hollow pile, tube, shaft, or other structure, is made to descend as before before described."

81. For an *Improvement in Looms for Piled Fabrics*; James Turnbull, Jr., and John Turnbull, Simsbury, Hartford county, Connecticut, January 29.

Claim.—"What we claim as our invention, is, 1st, dividing the heddles into two or more divisions to be worked in succession, substantially as described, that the entire opening of the shed may be effected in succession, and thus avoid the evil effects consequent on the opening of the shed at one operation as heretofore, as described.

"2d, Operating the two picker levers or treddles by means of a shifting tappet, operating or shifting alternately for each pick by means of an eccentric or its equivalent, that the shaft which carries the tappet or tappets may make one entire rotation for each throw of the shuttle, substantially as described, and thus operating the shuttle by a tappet rotating with greater velocity than by any means heretofore known, as described."

82. For an *Improvement in Mills for Grinding*; Benjamin Gould, assignee of Joseph W. Webb, Ledyard, Cayuga county, New York, January 29.

Claim.—"What I claim as my invention, is the combination of the cone screws, as above described, with the beaters or rubbers on the cylinder, substantially as described."

83. For *Improvements in Flour Bolts*; John M. Reed and William B. Willis, Charlestown, Jefferson county, Virginia, January 29.

Claim.—"What we claim as our invention, is the combination of the revolving wire screens with the ordinary bolts, whether stationary or revolving, for bolting flour, by which the larger particles of bran and extraneous substances, that may chance to pass into the bolts with the meal, are separated therefrom by the said wire screens, and are thus prevented from coming in contact with the bolting cloth, whilst the wings drive the flour through the screens and

bolting cloth by the combined action of centrifugal force and currents of air produced by the rotary motion of said wings, by which the advantages stated are gained."

ADDITIONAL IMPROVEMENT FOR JANUARY, 1850.

1. For an *Improvement in Ice Cream Freezers*; H. B. Masser, Sunbury, Northumberland county, Pennsylvania; patented December 12, 1848, additional improvement annexed January 1, 1850.

The patentee says,—“My additional improvements consist in making the centre dasher stationary, while the freezer or reservoir revolves around it, and in so constructing the dasher as, with a small amount of power, to scrape the frozen cream from the inner surface of the reservoir as soon as it accumulates thereon, during the whole process, thereby forming the cream into a firm and uniform mass in a very short space of time.”

Claim.—“What I claim is, 1st, the spring blade or scraper, constructed and employed as above described.”

RE-ISSUES FOR JANUARY, 1850.

1. For an *Improvement on the Carding and Spinning Machines Denominated the Card Spinner*, for manufacturing yarn from two or more different materials at the same time; Richard S. Stewart, Executor of George Law, assignee of Moses Chase, Baltimore, Maryland; patented March 23, 1842, re issued January 1, 1850.

Claim.—“What I claim as new, is the combination by which the said composition thread or yarn is produced, as described, consisting of the delivering rollers between which the covering material and the thread to be covered come in contact as described, combined with the said doffer cylinder, the spindle for twisting the thread while it is in contact with the covering material, and the spool supplying the thread to be covered, all as described, or their mechanical equivalents, in like combination and for the purpose set forth.”

2. For an *Improvement in Churns*; Z. C. Robbins, St. Louis, Missouri; patented June 1, 1849, re-issued January 1, 1850.

The patentee says,—“The nature of my invention consists in giving such a form to a rotating agitator that the beaters placed upon it will cut through the milk or cream edgewise, and, by their broad parallel or converging surfaces, raise a portion of the cream at each revolution up into the air in the upper part of the churn, and thereby separate the particles thereof, for it will readily be perceived that two broad parallel or converging surfaces, placed tangential to their circle of rotation, will raise a body of liquid filling nearly the whole space, and gradually distribute it above, while the outer surface will prevent its flying off; by which means I am enabled to get a greater amount of agitation, and distribute the milk or cream through the air more perfectly than in any other way by which it can be accomplished, the agitator performing, by its rotation, an operation upon milk or cream similar to that produced by knives upon the whites of eggs during the process of what is called whipping them up.”

Claim.—“What I claim as my invention, is the series of parallel floats and beaters formed and arranged within the agitator, substantially as above described, so that when their motion is reversed, their thick inclined rear edges will gather the butter into a roll in the centre of the agitator, substantially as herein set forth.”

3. For an *Improvement in Cooking Stoves*; James Root, Cincinnati, Ohio; patented July 18, 1848, re-issued January 22, 1850.

The patentee says,—“The nature of my improvement consists in carrying the ash-pit under the sunk hearth of the stove, so as to enlarge the oven, and in the manner of constructing and arranging the independent back plate of the fire chamber, so as to readily enlarge or contract said chamber, and direct the ashes into the pit beneath.”

Claim.—“What I claim as my invention, is the movable back plate, for contracting the fire and protecting the oven plates, as herein set forth; and I wish it to be understood that I do not claim the employment of double plates at the back of the fire, when such plates are stationary, but only when made movable, so that the front and top plates of the oven are always protected back as far as the flanch on the movable plates extends.

“I also claim, in combination with the elevated fire chamber, and projecting oven under

a part of said fire chamber, the ash-pit, formed by projecting the bottom and sides of the stove under the sunk hearth, which is level with the bottom of said fire chamber."

DESIGN FOR JANUARY, 1850.

1. For a *Design for Stoves*; Henry L. Sheperd, Dayton, Montgomery county, Ohio, January 8.

Claim.—"What I claim as my invention, is the combination and arrangement of the ornamental forms and figures represented in the accompanying drawings, forming an ornamental design for a cooking stove."

List of American Patents which issued in February, 1850, with Exemplifications by
 CHARLES M. KELLER, late Chief Examiner of Patents in the U. S. Patent Office.

1. For an *Improvement in Machinery for Spooling*; Avery Babbett, Auburn, Cayuga county, New York, February 5.

Claim.—"What I claim as my invention, is not the abstract production of friction between the thread or yarn and any other substance, as the thread or yarn passes from the runners to the bobbin or spool, so as to secure the winding of the thread or yarn tightly on the bobbin or spool; but I do claim the combination of machinery herein before described, whereby, in machines for winding yarns or threads on bobbins or spools, the thread or yarn, on its passage from the runners to the bobbin or spool, has applied to it friction produced between the thread or yarn and any other substance, which friction diminishes with uniformity as the pull upon the thread or yarn from the runners increases, and increases with uniformity as the pull upon the thread or yarn from the runners diminishes; such combination consisting, as shown in the accompanying drawings, of the vibrating lever, the stand, the joint, the three pins N O P, the four pins H I J K, the box, the spiral spring, any one of the three hooks, the staple at K, and the guide, substantially as set forth."

2. For an *Improvement in Carding Machines for Preparing Bats for Felting*; Samuel G. Blackman, Norwalk, Fairfield county, Connecticut, February 5.

The patentee says,—"The nature of my invention consists in interlocking the fibres of wool while they are on the doffer of a carding machine, by curling their extremities backwards, laterally, or obliquely, by means of the action of some suitable rubbing or combing surface, brought nearly in contact with the teeth of the doffer."

Claim.—"What I claim as my invention, is the production of the requisite interlocking combination of the fibres of wool preparatory to converting the same into felt cloth, by subjecting the said fibres to a rubbing or combing action while they are upon the doffer of a carding machine, by means of auxiliary cards or other suitable friction surfaces, substantially as herein set forth; not intending by this claim, however, to limit myself to the special and particular manner of producing the said interlocking of the fibres of wool while they are upon the carding machine doffer, as herein set forth."

3. For a *Preparation of Portable Soup Bread*; Gail Borden, Jr, Galveston, Texas, February 5.

The patentee says,—"The nature of my invention consists in extracting the nutritious parts of flesh or animal meat of every description, and combining this concentrated extract with flour or vegetable meal, and baking the two substances in an oven, thereby forming a portable desiccated soup bread, containing a large amount of the most important alimentary substance, in a very small bulk and convenient form, well adapted to seafaring purposes, travelers, hospitals, and also for family use, which will save the trouble and expense of much cooking."

Claim.—"I claim the new and useful manufacture of desiccated soup bread, formed of the concentrated extract of alimentary animal substances, combined with vegetable flour or meal, made into cakes and baked into bread, in the manner substantially as herein described, for the purpose set forth."

4. For an *Improved Excavating Auger*; James Buck, Buckport, Hancock county, Maine, February 5.

Claim.—"What I claim as my invention, is the formation of a machine or instrument for boring the earth under water or otherwise, and retaining the substance bored until it can be

brought to the surface, which I construct in the manner following: I first make two sections of a cylinder, or pods, the one of which is enough smaller than the other to admit its turning into the larger one, and I connect them together by pivots through the ends of each, the larger section of a cylinder, or pod, having a lip similar to a pod auger, and I attach a shaft or handle firmly to the upper pivot, which pivot passes through the centre of the outer section of a cylinder, or pod, and is attached firmly to the smaller section of a cylinder, or pod, so that, by turning the shaft one way, I put it into a pod auger shape ready for boring; by reversing the motion of the handle or shaft, it turns the inner section of a cylinder out of the other, making it into a cylindrical or bucket shape, and thereby secures the substance bored."

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5. For an *Improvement in Whip Lashes*; David N. Day and Edward B. Day, Westfield, Hampden county, Massachusetts, February 5.

The patentees say,—"Our invention consists in making the whip lash by the combined operations of spinning, and twisting, and plaiting: that is to say, by plaiting spun and twisted threads of cotton, silk, and other fibrous substances, instead of thongs or strips, which, from the difficulty of obtaining of the requisite length, require to be frequently spliced in the operation of plaiting, and do not possess the same pliancy as threads; the plaiting of such lashes in the manner described being done on a core, made of a cord, extending through the whole length of the lash, that it may sustain the strain to which whip-lashes are subjected, and thus protect the plaited cover from injury by being pulled, and the swell of the core being made of any kind of cloth which is pliant, and attached to, and combined with, the central core, the said cloth being cut in an elliptical form, and attached to the central core without rolling it up, that by plaiting around it, for (from) the pliancy of the cloth, it will be compressed into the required form to leave the outside of the lash round and smooth."

Claim.—"What we claim as our invention, is a new manufacture for whip-lashes, by making plaited whip-lashes of spun and twisted threads or cords, as described, instead of leather thongs, the same being plaited over a central cord or core extending the whole length as described, and a swell made of cotton, or other soft and pliable cloth, attached to the central core without rolling, substantially as described."

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6. For an *Improvement in Machines for Cutting Staves*; Charles B. Hutchinson, Waterloo, Seneca county, New York, February 5.

The patentee says,—"The nature of my invention and improvement consists in arranging upon a suitable platform, and in close proximity, apparatus for cutting and jointing the staves, and cutting the heads of barrels, casks, &c., of such form and construction as will cut the staves to the proper curvature, and joint their edges with a drawing stroke, and cut the heads upon a like principle, with correctness and despatch, smoother and with a thinner knife than the modes generally employed for these purposes, and less liable to check the staves; and also in applying to the apparatus, minor improvements, which will be made apparent in this specification."

Claim.—"What I claim as my invention, is the mode of cutting staves to the required curvature with a spiral drawing stroke, by means of the segmental plate, having bars or ribs at its ends to which the knife is attached; segmental rims, moving in the segmental slots formed in the side plates, and containing slots through which the segmental plates move, spiral slots in the segmental plates, and bars passing through the same, substantially as set forth."

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7. For an *Improvement in Washing Machines*; Joel Haines, West Middleburgh, Logan county, Ohio, February 5.

Claim.—"What I do claim, is making a disk with a hinged segment, to admit the clothes beneath the same, being so arranged as to rise and fall vertically as it is turned horizontally over the clothes, by turning the vertical rock shaft to the right and left, as described."

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8. For *Improved Friction Roller Sash Supporters*; Joseph Maynard, Philadelphia, Pennsylvania, February 5.

The patentee says,—"My invention consists in fitting each sash of a window with friction rollers let into its edges, and pressed by springs against the window frame, the rollers being so arranged that, while they turn freely and offer no hindrance to the raising of the sash, yet when the sash is raised, they bind in their sockets so tightly that the friction engendered prevents it from descending by its own weight."

Claim.—"What I claim as my invention, is the combination of the loose roller, spring,

and friction wheel, applied to the window sash, as herein set forth, whereby the sash is held in any position to which it may be raised."

9. For *Improvements in Engines for Carding and Drawing Wool*; Charles Jackson and James Moir, Cazenovia, Madison county, New York, February 5.

The patentees say,—“The nature of our invention consists in providing a condensing cylinder, with a reciprocating rod, to give the said cylinder a reciprocating motion in combination with its usual rotary motion, so as to spread out and mix the wool better than has been heretofore done, for the production of better roving, and to obviate the employment of more than one doffer.

“Also, in providing a twisting band and drawing rolls, to be used in combination with rubbing rolls of the common construction, to draw the roving on the carding machine, reducing it, prepared for the jack or spinning machine.”

Claim.—“1st, We claim the combination of what is termed the main or condensing cylinder with the reciprocating rod, to give the carding cylinder a reciprocating side to side motion in combination with its rotary motion, in the manner substantially as herein described, or in any other manner substantially the same, to produce the same effects.

“2d, We claim the combination of a twisting band and drawing rolls with rub rolls of the common construction, for the purpose of reducing roping by drawing it with twist upon the carding machine, in the manner substantially as herein described, or in any other analogous manner.”

10. For an *Improved Method of Punching Between Rollers*; Richard Montgomery, City of New York, February 5.

The patentee says,—“My improvements consist in a combination of several elementary processes in one, for the purpose of facilitating the manufacture, the advantages of which are, a greater expedition in the construction of a boiler, and greatly reducing the cost, while I am enabled thereby, also, to increase the strength over an ordinary boiler.”

Claim.—“What I claim as new, is the apparatus for the purpose of punching, consisting of a series of punches thrown out at proper intervals, substantially as above described, either with or without the combined operation of corrugating said plates, as above described.”

11. For an *Improvement in Calculating Machines*; Du Bois D. Parmelee, New Paltz, Ulster county, New York, February 5.

The patentee says,—“The nature of my invention consists in an apparatus for making accurate additions of long columns of figures, by means of a movable index or register acted upon by the keys of a finger-board.”

Claim.—“What I claim as of my own invention, is the making additions of figures by means of a finger-board of keys, each communicating a proper and known motion to an indicator, substantially in the manner and for the purposes described.”

12. For an *Improvement in Water Metres*; William Sewell, Jr., Williamsburg, Kings county, New York, February 5.

The patentee says,—“My invention consists in arranging an apparatus so as to move with the least amount of force that can be attained, and maintain the metre water-tight, or nearly so, and in affording the greatest capacity within a given compass.”

Claim.—“What I claim as new, is the employment of a flat spring, with both sides of which the water, as it enters, communicates, substantially in the manner and for the purposes set forth, in combination with the wings, with an adjusting spring in the centre, by means of which improvements I relieve the apparatus from danger arising from obstructions in its movement, and the strain caused by the transmission of a non-elastic fluid, and cause it to move with less friction than any other form with which I am acquainted.”

13. For an *Improvement in Attachments for Lightning Conductors*; James Spratt, Cincinnati, Ohio, February 5.

Claim.—“What I claim as new, is forming the eye of the metallic attachment with an opening, to allow the passage of a lug on the neck of the isolator, and so that the rod also can be inserted after the attachment is secured to its place, when this is combined with a lug on the shank of the attachment corresponding to that on the isolator, substantially after the

manner and for the purposes set forth: that is to say, enabling the rod at any time to be inserted or withdrawn, without disturbing the attachment in the building."

14. For *Improvements in Barrel Machinery*; Solomon Andrews, Perth Amboy, Middlesex county, New Jersey, February 12.

Claim.—"I claim as my invention in the stave cutter, the eccentric groove and cap extending over and around the shaft to the side opposite the knife, the said cap constituting a part of the eccentric cam ring passing around the shaft, and having an opening through the said cam ring at the posterior termination of the cap, where the staves make their exit. And I also claim the whirl or secondary shaft, as described, in combination therewith.

"I claim as my invention, the right and left stave-holders in the jointer, having flanches or thumb pieces to support the edge of the stave during the operation of jointing, and to ensure an equal width at each end.

"I also claim as my invention, the horizontal jointer, in combination with an inside and an outside frame, to which the right and left stave-holders are attached by hinges, and by which arrangement four or more boys may work around one horizontal wheel or jointer and operate simultaneously, being also thereby enabled to joint the staves with the grain of the wood, without loss of time.

"I claim as my invention, the movable centre in the head machine, in connexion with the opposite face plate on an universal joint, between which the head block is held before it is brought in contact with the rubber of the face of the chuck, and the slide which holds the chisels, substantially in the manner set forth.

"I claim as my invention, the combination of the cutter with the jointed spring cutter and levers for cutting the locks in wooden hoops, substantially as described."

15. For a *Machine for Cutting Cotton Stalks in the Field*; Fields Bradshaw, Clinton, Greene county, Alabama, February 12.

Claim.—"What I claim as my invention, is the adaptation of iron and steel knives or cutters to the cutting down, and cutting to pieces, of cotton stalks, either in a green or dry state, in the manner and for the purpose described."

16. For *Improvements in Machinery for Folding Cloth*; Augustus C. Carey and Daniel C. Bagley, Aneshury, Essex county, Massachusetts, February 12.

The patentees say,—"The nature of this invention consists in placing at the upper part of a suitable frame a horizontal table, having an up and down movement, and arranging on the side of the same horizontal shafts, having sharp toothed combs or prickers, notched bars, and bent bars or arms attached, and connected by radial arms, and connecting-rods or bars to a horizontal revolving shaft, which operates a graduated notched wheel, in such a manner as to fold the cloth, and measure the same as it is laid evenly on said table."

Claim.—"What we claim as our invention, is the mode of folding and laying the cloth on the table or platform, kept in a state of equilibrium by the weight, wheel, chain, and rod, by means of the notched bars attached to the radial rods secured to the shafts, combs attached to the shafts, segmental plates, bent bars, arms, horizontal and inclined connecting-rods or bars, slotted arm or crank, constructed, combined, arranged, and operated as herein set forth."

17. For an *Improvement in Rule and in Socket Joints*; Charles Chinnock, City of New York, February 12.

Claim.—"What I claim as my invention, is the application to the rule joint, and to the ball and socket joint, of the rod, which is hinged into the ball or rule joint, to hold the joint as firm as desired by means of the spiral spring on the India rubber springs, as described."

18. For *Improvements in Arrangements of Flyers and Spindles*; John Dermond, Paterson, Passaic county, New Jersey, February 12.

The patentee says,—"My invention consists in bolting, or in any other way firmly securing, the spindle to the step or foot rail of the machine, and in having the tube, to which the flyer is attached, with its inner diameter greater than the diameter of the spindle, so that it revolves outside the spindle concentric with it. The spindle and tube are entirely independent of each other, and do not touch each other while working. This arrangement will obviate the inconvenience generally found to arise from the vibration of the spindle when it revolves with

the flyers attached, and will preserve an uniform drag on the thread while it is being twisted. The lower end of the tube rests in a step-bearing attached to the frame of the machine, and is kept in a vertical position by means of a guide near its upper end. This guide, and also the step-bearing, are capable of adjustment should the tube deviate from a vertical position."

Claim.—"What I claim as my invention, is the manner of suspending the flyer separate from the spindle, by the flyer being connected to, and forming a part of, the tube, the lower end of which revolves in a socket-bearing, allowing the spindle of the bobbin to pass and move through it without touching it, so that, however great the speed of the flyer may be, it will be prevented from vibrating the spindle."

19. For *Improvements in Air-Heating Furnaces*; Henry A. Engles, Cincinnati, Ohio, February 12.

The patentee says,—"The nature of my invention consists in arranging a pair of concentric cylinders over a furnace, so that the flue can be made to pass spirally between the cylinders, thus making the inside face of the inner cylinder and the outside face of the outside cylinder radiating surfaces; and, in addition to this attaching the base of a cone-shaped drum or chamber to, and inside, the lower end of the inner concentric cylinder, (or in any other suitable way,) so as to obtain a radiating surface from the outside of the drum, which is thus made to form the roof of the furnace; the whole fixtures thus being made to furnish the most extensive radiating surface within the smallest possible compass. This arrangement also enables a small air chamber to furnish a comparatively large amount of heated air.

"Another feature of my invention consists in combining with the furnace a steam-infuser, whereby the heated air in the chamber surrounding the furnace is supplied with an adequate degree of moisture, so arranged as to be regulated at pleasure, and thus obviating the unhealthy and disagreeable effects due to air which, in the process of being heated, is rendered too dry for being breathed, and therefore unfit for domestic or other apartments."

Claim.—"What I claim as new, is constructing a furnace for heating air with a spiral flue passing up between concentric cylinders, when this is combined with a conical roof to the furnace within the inner concentric cylinder, thus obtaining the most extensive radiating surface within the least space, and in the most compact and simple form."

20. For an *Improvement in Augers for Boring Machines*; George Flautt, Cavetown, Washington county, Maryland, February 12.

The patentee says,—"My machine is arranged to bore a series of holes according to a pattern attached to the carriage on which the post is secured, and the auger is composed of two separate portions, the cutting bit and the pod, the latter revolving upon the stem of the former with a greater velocity, thus quickly discharging the chips removed by the cutting bit, and preventing the choking of the hole."

Claim.—"What I claim as my invention, is making the pod of an auger separate from the stem, on which it is revolved with a considerably greater velocity than the cutting bit, substantially as herein set forth."

21. For an *Improvement in Horse Rakes*; Alvan Hovey, Brookfield, Orange county, Vermont, February 12.

Claim.—"What I claim as my invention, is the method of working the rake-head by means of the treadle, in combination with the hand bars and the back piece, as described. I also claim the attachment of the stilts to the thills, in the manner and for the purpose described; all of which gearing being so arranged that a person on his seat may change and discharge, or suspend, the rake-head at pleasure, as herein set forth."

22. For an *Improvement in Hanging Carriage Bodies*; M. G. Hubbard, Hume, Alleghany county, New York, February 12.

The patentee says,—"The nature of my invention consists in the peculiar construction and arrangement of the reaches, and in the application of a spring thereto, by which the carriage is supported."

Claim.—"What I claim as my invention, is the combination of cross reaches and spring, substantially in the manner and for the purpose set forth."

23. For an *Improvement in Railroad Trucks*; James Ingersoll, Grafton, Loraine county, Ohio, February 12.

Claim.—"What I claim as new, is the combination of an endless track, on the frame of

the carriage, with an endless series of rollers, running thereon and guided by flanches, the endless track being supported on the peripheries of the rollers which intervene in endless succession between it and the surface of the ground or rail, and which are broad enough to keep themselves erect and steady without the use of axles or rods extending across the carriage."

24. For *Improvements in Planing Machines*; Nicholas G. Norcross, Middlesex county, Massachusetts, February 12.

Claim.—"What I claim as my invention, is the combination of the rotary planing cylinder, and the rest, with mechanism by which the two can be freely moved up or down, simultaneously and independently of the bed or platform, or any analogous device, substantially in the manner and for the purpose of reducing a board to equal thickness throughout its length; all as specified.

"I also claim the above described improvement of making the under side of the rest concave, in combination with so extending the part under the rest, and applying it to the concave part thereof, as to cause the board, as it passes across the rest, to be bent and presented with a concave surface to the operation of the rotary cutter planing cylinder, substantially as specified, the same being for the purpose mentioned."

25. For an *Improvement in Bed-Clothes Clasps*; Francis A. Rockwell, Ridgefield, Fairfield county, Connecticut, February 12.

The patentee says,—“My invention consists, 1st, of applying clasps, by means of springs with screws, or the cam and lever acting upon a bar or spring, to the rails, timbers, or frames of bedsteads, on either side or end, and on either side or end of the rails, timbers, or frames thereof.”

Claim.—"What I claim as my invention, is the use of the cam and lever, acting on the spring, to constitute a clasp in the manner and for the purpose set forth."

26. For an *Improvement in Tanning Apparatus*; Wm. H. Rosensteel, New Oxford, Adams county, Pennsylvania, February 12.

The patentee says,—“My improvements relate to the general plan of the tannery, to the manner of constructing and operating the liming vats, the manner of constructing and operating the vats in which the skins are tanned, and the manner in which the hides are handled.”

Claim.—"What I claim as my invention, is, 1st, revolving the tanning cylinders alternately in opposite directions, substantially as herein set forth.

"2d, Handling the hides in the spent liquor from the tan vats, substantially in the manner set forth.

"3d, Liming hides or skins in a close revolving cylinder, substantially as set forth."

27. For an *Improvement in Smut Machines*; Leonard Smith, Troy, New York, February 12.

The patentee says,—“The nature of my invention consists in the so arranging the machine, that the blowers and the whole scouring machinery are combined and arranged in the same casing, and rendered a complete machine in itself for pulverizing the smut, scouring and separating the smut, chaff, and other foreign matter, and acting on the fibre ends of the kernel, where smut and other dirt is most likely to adhere.”

Claim.—"What I claim as new, is, 1st, the grates in the top of the machine, in combination with the scrolls or spiral chambers and spouts, for discharging smut and other light materials carried up by the blast, as set forth.

"2d, I claim the chamber at the bottom of the cylinder, which concentrates and gives free discharge to all foreign matter to be separated from the grain by the blast in the last stage of operation of the machine, in the manner described.

"3d, I claim, in combination with the concave bottom which gathers the grain for its discharge from the machine, the distributors which give direction in the discharge of the grain separated from the foreign matter by the blast.

"4th, I claim the draft floats, in combination with the scouring surfaces, for cleaning buckwheat, as set forth. The whole being constructed, arranged, and operating substantially in the manner and for the purpose set forth."

28. For an *Improved Method of Bolting in Window Shutter Openers and Fasteners*; Saml. B. Snedaker, Cincinnati, Ohio, February 12.

The patentee says,—“The nature of my invention consists in an arrangement of mechanism whereby a window blind, operated from within the house, can be fastened in any desirable position, in such a way as at the same time to relieve the pintle of the hinge from any strain athwart its axis.”

Claim.—“What I claim as new, is fastening the window blind at any suitable point, by means of bolts projecting on opposite sides of the pintle of the hinge, by a driver, the bolts and driver being suitably guided, and the bolts passing into suitable notches on a plate attached to the blind or to the upper leaf of the hinge, thus not only retaining the blind in any desired position, but also at the same time relieving the pintle of the hinge from any strain athwart its axis; the whole being arranged substantially in the manner and for the purposes described.”

29. For an *Improvement in Electric Telegraphs*; William S. Thomas, Norwich, Chenango county, New York, February 12.

The patentee says,—“My invention consists in making marks or signals for telegraphic purposes, by means of the heat generated, developed, or controlled by the passage of an electric current along attenuated conductors, wires, or points.”

Claim.—“What I claim as new, is the making of signals or marks for telegraphic purposes, by the agency of the heat generated, induced, or controlled by a current of electricity passed along attenuated conductors, wires, or points, substantially as herein set forth; the signals being the flashes of light emitted by the heated conductor or points, are manifest to the eye of the operator; the marks being produced on the paper by the heated points or conductor, are the record of the message.”

30. For an *Improvement in Castors for Furniture*; Solomon B. Ulmann, City of New York, February 12.

The patentee says,—“The nature of my invention consists in bringing the centre of the roller of the castor in or near the line of the centre of the foot to be supported, whereby the castor is rendered less liable to be thrown out of repair, and makes a better finish to the leg and foot of furniture.”

Claim.—“What I claim, is neither the ball, the socket, the vertical pivot, or either of the pivots of the ball, but the combination of the whole as above substantially specified, whereby the ball of the castor is enabled to revolve across the two centres of the two axes of the ball as set forth.”

31. For an *Improvement in Connecting Trucks with Car Bodies*; George Vanderhoof, Paterson, Passaic county, New Jersey, February 12.

Claim.—“What I claim as my invention, is the mode of attaching car bodies to trucks, by means of the trough, (with the sloat and king bolt,) and the rail constituting the segment traverse, as above described.”

32. For *Improvements in Machinery for Turning Umbrella Sticks, &c.*; Solomon West and Hiram Plumb, Honesdale, Wayne county, Pennsylvania, February 12.

The patentee says,—“The nature of this invention consists in introducing the stick to be cut to revolving knives or cutters, arranged at the end of a hollow shaft, and made movable, so as to make them conform with any required diameter of stick, and causing the stick, after being properly turned, to be drawn through said hollow shaft by means of a receiver or carriage moving on slides, and discharged at the back part of the machine; the several parts for producing these effects being operated by band, cogged and bevel wheels, secured on suitable shafts turning in boxes in the frame, and put in motion by manual or other convenient power.”

Claim.—“What we claim as our invention, is the combination of the hollow shaft or cylinder, graduating cutters or knives, made and ground exactly alike, and arranged on opposite sides of said shaft or cylinder, and cutting inward and in exact unison with each other; the feeding rollers arranged in front, and the receiver or carriage arranged in the rear of the shaft, together with the case surrounding the cutters and wings, for enabling them to act as a fan or blower to discharge the shavings; the whole being arranged and operating substantially as set forth.”

33. For an *Improvement in Studs for Shirt Bosoms*; James P. Heiss, Philadelphia, Pennsylvania, February 12.

The patentee says,—“My invention consists in a jointed shank or stem composed of two sections, the one of which is fixed to the back of the stud, and projects perpendicularly therefrom, the other is hinged to the former in such manner that it can be turned in line therewith, to allow it to pass through an eyelet hole made in the garment, after which it is turned at right angles to the stationary piece, thus forming a T-head which holds the stud to the garment.”

Claim.—“What I claim as new, is constructing the shank in two sections, the first being fixed to, and projecting from, the back of the stud, and the other being hinged to the first in such manner that it can be brought in line with it, or be turned across it, as herein set forth.”

34. For an *Improvement in Elevating and Lowering Carriage Tops*; John L. Allen, Syracuse, Onondaga county, New York, February 19.

The patentee says,—“The nature of my improvement consists in connecting a handle, lever, or any analogous device, upon the inside of carriage tops, with joints or jointed braces upon the outside, by which means the top may be let down or braced up from within.”

Claim.—“What I claim as my invention, is connecting a handle, lever, or any analogous device, upon the inside of carriage tops, with joints or jointed braces upon the outside of the same, substantially in the manner and for the purpose set forth above.”

35. For *Adjustable Rollers for Window Curtains*; Edward S. Clark, Suffolk county, Massachusetts, February 19.

Claim.—“What I claim is my improvement in the construction of the curtain roller, whereby I do not only obtain all the advantages of securing the cloth to it by the groove and strip, but am enabled to regulate or adapt the roller to any window of any ordinary width; my said improvement consisting in making the curtain roller and its guide-heads in two parts, in such manner that the grooved section of the roller and one head shall be united together and form a separate part, while the other section or tongue, and the other head, shall also be united and constitute another part, the two being so applied that, when put together, the tongue may be slid or fitted endwise into the groove in manner described; such a combination of the heads and groove, and tongue sections enabling me to cut each section to the length required, and to readily adapt the roller to a window.”

36. For an *Improvement in Lids for Boiler Holes of Cooking Stoves*; Thomas G. Clinton, George H. Knight, and Edward H. Knight, Cincinnati, Ohio, February 19.

The patentees say,—“One part of our invention consists in so connecting the lid or centre plate, as the case may be, by a symmetrical joint with the stove top, as that the lid or centre plate becomes as permanent a fixture to the stove as its oven or fire door, and at the same time fits and fills flush with, or not exceeding the level of the top surface of the stove, the depressions and appendages going to form the joint, whether the lid or connecting plate be thrown on or off the boiler openings.

“Another part of our invention consists in the appendage of a pivot or fulcrum upon which the lid can be rotated, and in so arranging the joint that the lid, when thrown open, can have either its external or flue surface presented uppermost, as may be desired.

“Another part of our invention consists in constructing the lid, with the joint so arranged at the edge of the stove top, that the lid can be manipulated at its coldest point, and by means which present no obstruction to the cooking apparatus; this arrangement also enabling us to dispense with the usual depression for inserting the hook, the said depression being necessarily placed at the hottest part of the lid, and besides this being difficult to mould, and being also objectionable as a receptacle for ashes.”

Claim.—“What we claim as new, is, 1st, so arranging the lid or centre plate in connexion with the top plate of the stove, as that the lid or centre plate, when withdrawn from the opening, may be made to add its area to, and at the same time lie flush with, or below, the level of the top of the stove, this being effected by a neck proceeding from the lid or centre plate in the direction of its plane, said neck (whether the lid or centre plate be closed or folded back) fitting and filling a notch in the stove top, and having lugs projecting from its sides, which lugs, bearing upwards against the top plate, or against the shoulders projecting therefrom, sustain the lid when folded back.

“2d, The arrangement substantially as described, of journals on the neck, at or about midway of its length, forming a fulcrum upon which the lid can be folded back, either with its

top face or with its flue face uppermost, the lugs in this case being behind the journals, and midway of the thickness of the neck.

"3d, Constructing the lid or centre plate with a handle projecting therefrom in the direction of its plane, and at its coldest point, so as to afford a means of operating the lid by hand with comparative impunity and facility, and so as to avoid, on the one hand, any impediment to the shifting of the cooking utensils, and, on the other hand, the usual cavity difficult to mould, liable to collect dirt, and placed unavoidably at the hottest part of the lid."

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37. For *Improvements in Raising and Lowering Carriage Tops*; Solomon Goddard and Henry Warfield, Truxton, Cortlandt county, New York, February 19.

The patentees say,—"The nature of our invention consists in so connecting the jointed braces upon the outside of carriage tops at their lower extremities, as that when one of the jointed braces is thrown back, the corresponding one on the opposite side will also be thrown back by the same effort."

Claim.—"All that we claim as of our invention, is connecting the jointed braces upon opposite sides of carriage tops, by means of a shaft or rod passing back of the seat, in such a manner that the braces may be worked simultaneously upon both sides, substantially as herein described."

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38. For an *Improvement in Locking Portable Safes to the Floor*; Henry Hochstrasser, Philadelphia, Pennsylvania, February 19.

The patentee says,—"The nature of my invention consists in making a box with a lock on the lid or front, which box may be attached temporarily or permanently to any desired place, to the bottom of a trunk, for the safe keeping of articles of value, and by the use of the thumb wood screws (which accompany the box for the temporary fastening) the trunk may be secured to the floor, and cannot be removed until the box is unlocked and screws withdrawn; also, can be attached in a few minutes to a bureau drawer, to vessels, railroad cars, &c., affording a safe depository, the usual fastening of trunks, &c., having no real security from burglars and others."

Claim.—"What I claim as my invention, is the device for locking down a portable safe or box to the floor, and at the same time locking the box, as described."

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39. For an *Improved Process of Varnishing Buttons*; Elisha M. Pomeroy, Wallingford, New Haven county, Connecticut, February 19.

Claim.—"What I claim as my invention, is the process of japanning and baking the buttons in bulk, substantially as described, after they have been prepared for the reception of a smooth coat of japan or other varnish, in the manner specified in my former letters patent respectively, or in any other method substantially the same."

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40. For an *Improvement in Portable Fences*; Peter M. Purdy, Haysville, Ashland county, Ohio, February 19.

The patentee says,—"My invention consists in a device for fastening the adjoining ends of fence panels together, which possesses the requisites of durability and cheapness, and can moreover be easily applied to, and disconnected from, the panels."

Claim.—"What I claim as my invention, is fastening together the panels of portable fences, substantially as herein set forth, by means of binding irons and wedges."

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41. For an *Improvement in Hulling Clover Seed*; Allen R. McGriff, administrator of Joseph Pollock, deceased, Richmond, Wayne county, Indiana, February 19.

Claim.—"What I claim as my invention, is the arrangement and combination of the cylindrical cups with each other, for the purpose of discharging the grain at C, and the lighter materials at O, as described."

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42. For an *Improved Method of Kneading Dough*; Henry N. Rider, North Adams, Berkshire county, Massachusetts, February 19.

The patentee says,—"My invention consists in passing the dough alternately in opposite directions beneath a reciprocating breaker, by which the kneading is effectually performed; and also in the various devices by which the several motions of the breaker and kneading table are obtained and regulated."

Claim.—"What I claim as my invention, is the combination of a reciprocating kneading table with a reciprocating breaker, substantially as herein set forth, but irrespective of the devices by which they are severally put in motion."

43. For a *Breast Plate for Harness*; Joseph B. Sawyer, Templeton, Worcester county, and Sylvanus Sawyer, Monson, Hampden county, Massachusetts, assignees of Orrin Ramsdell, Westfield, Orleans county, Vermont, February 19.

Claim.—"What I claim as my invention, is the centre draft and expansion breast plate for the horse harness, in combination with the use of the double fulcrum self-adjusting pad, applied either to the double or single harness, as set forth."

44. For an *Improvement in Bedstead Fastenings*; Robert Ramsey, Wilmington, Mercer county, Pennsylvania, February 19.

The patentee says,—"The nature of my invention consists in providing iron tenons for the rails of a bedstead, and iron mortises for the posts, that connect with each other in the post, and receive the tenons on an inclined plane, so as to fasten the whole bedstead together by the sinking of the rails, without the use of screws or other fixtures on the outside of the posts or rails."

Claim.—"What I claim as my invention, is the employment of bush pieces, locked by the key piece in the manner and for the purpose set forth."

45. For an *Improvement in Fences*; Isaiah Subers, Philadelphia county, Pennsylvania, February 19.

The patentee says,—"The nature of my invention consists in the method of constructing a fence, the parts of which, when put together, fasten themselves firmly without the use of lead, rivets, screw bolts, wedges, or any other of the modes heretofore adopted for the purpose."

Claim.—"What I claim as my invention, is the method of constructing a self-adjusting and self-fastening fence of any material whatsoever, substantially such as herein described, the parts of which, when put together, fasten themselves firmly by means of a combination of locks and chairs, substantially as described, without the use of lead, rivets, screw bolts, wedges, or any other of the modes heretofore adopted and used for that purpose."

46. For an *Improvement in Seed Planting Barrows*; Charles A. Wakefield, Essex county, New York, February 19.

Claim.—"What I claim as my invention, is the employment of the gauge plate of variable thickness, in combination with the movable tube, and face plate and its springs, the same being applied to the hopper and conducting tube leading into the furrow opener, and the whole being made to operate substantially as specified."

47. For an *Improved Seed Planter*; Charles A. Wakefield, Essex county, New York, February 19.

Claim.—"What I claim as my invention, is the combination of the curtain or apron with the cylindrical or broad cast regulator.

"I also claim the manner of constructing the regulator, or in other words, the combination of the prism with the side plates or boards, and their adjusting and confining mechanism, as set forth."

48. For an *Improvement in Burning Ornamental Figures on Wood*; Hamilton Wood, City of New York, February 19.

The patentee says,—"My improvement consists, first, in the method of constructing the dies or moulds; second, in the treatment of the wood in removing the charred or burnt surface, so as to leave a perfect figure; and third, in the discovery of a peculiar tool or brush as applied thereto."

Claim.—"What I claim as my invention, is, 1st, the method I have described for constructing the mould or dies, so as to allow for the excessive depth they will char the wood in certain parts of figures, in order that the whole figure when finished shall be an exact resemblance of the original.

"2d, I claim the channels, or other like devices, cut in the face of the dies, for escape passages for the gases, smoke, &c.

"3d, I claim the use of an alkaline and acid solution or baths, to aid the removal of the charred surface."

49. For an *Improvement in Measuring Cloth on Looms*; John W. Robertson and John G. Webster, Lowell, assignees of John G. Webster, Middlesex county, Massachusetts, February 19.

Claim.—"What I claim as my invention, is the arrangement of the roller and clock-work directly upon the breast beam of the loom, and with respect to the cloth or selvage thereof, as specified."

50. For an *Improvement in Seraphines*; Rufus H. Green, Poultney, Rutland county, Vermont, February 19.

The patentee says,—"The nature of this improvement consists in a new and improved construction of sounding reeds, and an improved mode of applying power to the blowers."

Claim.—"What I claim as new, is, 1st, the combination of wooden sounding reeds with wooden reed plates, constructed in the manner described.

"2d, The combination of the adjustable blocks with the duplicate blowers and the lifting rods, arranged as described.

"3d, The combination of the two sounding boards, and the piano board, with the sounding reeds and keys, arranged in the manner and for the purposes set forth."

51. For an *Improvement in Machines for Cutting Cap Fronts*; George Burgess, City of New York, February 26.

Claim.—"What I claim as new, is the construction and application of the frame with the blades, and guide pins taking holes in the bed *e*, to work in either direction from the centre, all these parts being constructed and operating substantially as described. And I claim, in combination with the foregoing, the bed *k*, fitted with supporting guide rollers 11 and 12, and adjusting bar 14, with rollers 15, moving over the bar *l*, and taking the indentations, to adjust the position of the material over the cutter blades; the whole constructed and operating substantially as described and shown."

52. For an *Improvement in Gas Generating Apparatus*; Christopher F. Brown, Baltimore, Maryland, February 26.

The patentee says,—"My improved apparatus and mode of producing gas consists in so arranging a retort for producing an illuminating gas, and adapting a furnace thereto, as to produce a brilliant illuminating gas from rosin, combined with a due proportion of decomposed water charged with carbon."

Claim.—"What I claim as new, is the supply tube combined with the vaporizing cup as herein set forth, for the double purpose of supplying liquid for making gas, and for vaporizing the same before it comes in contact with the decomposing surfaces in the retorts for the purpose set forth. I also claim the compound retort, constructed and arranged as specified."

53. For an *Improvement in Sofa Bedsteads*; Edwin B. Bowditch, New Haven, Connecticut, February 26.

The patentee says,—"My invention consists in arranging the ordinary seat of a sofa in such a manner as to revolve upon pivots at the ends, in a frame which is hinged to the front of the sofa in such a manner as to be thrown open, and, by revolving the ordinary seat in this frame, bring the stuffed side up, and on a level with another seat or bed placed under the ordinary seat, thereby forming a bed."

Claim.—"1st, What I claim as my invention, is the ordinary seat of a sofa or other suitable article of furniture, so arranged as to revolve on a centre at each end, in a frame so constructed as to turn over and bring the top or stuffed side of the seat (by revolving the same) on a level with another seat or bed placed under the ordinary seat.

"2d, I also claim the use of the stuffed ends forming the support for the top seat when turned over and used as a bed.

54. For an *Improvement in Connecting Hubs with Axles*; Junius Foster, Bridgeport, Fairfield county, Connecticut, February 26.

Claim.—"What I claim as my invention, is enclosing the spring collars, that fit and run in the groove of the axle, within a box at the inner end of the hub, substantially as described, when this is combined with the ring fitting to, and turning on, the outer periphery of the box, and acting on the ends of the spring collars, for the purpose of drawing them out of the groove when it is desired to take off the hub, substantially as described."

55. For an *Improvement in Churn Dashers*; Isaac D. Garlick, Lyons, Wayne county, New York, February 26.

Claim.—"What I claim as my invention, is the hinging the series of beaters to the dasher rod in such a manner that their faces will be thrown into inclined positions by the upward movement of the dasher, and into horizontal positions by the downward movement thereof, when the said vibrating beaters are combined and act in concert with the series of vertical-faced beaters or wings upon the same dasher rod, substantially as set forth."

56. For an *Improvement in Iron Railings*; William Hamilton, Philadelphia county, Pennsylvania, February 26.

The patentee says,—"My improvement consists in the construction and combination of the parts forming the joint between the upright paling or rail and the cross bars and string pieces."

Claim.—"What I claim is constructing the palings or upright rails, as described, with holes in them, by means of which they slide freely on the horizontal bars, and with a cavity for containing lead or other proper metal, surrounding said bar, for the purpose of allowing the palings to be placed and fastened at any desired distance from each other, substantially in the manner and for the purpose set forth, by means of which I form a cheap and perfect railing of different lengths with the same number of palings, and firmly secure the rails in place."

57. For an *Improvement in Clothes Frames*; Humphrey Kempton, Fairhaven, Bristol county, Connecticut, February 26.

Claim.—"What I claim as new, is the combination of the jointed arm, bars, and rods, with the collars and the mast, by means of the stay cords, substantially in the manner and for the purpose herein set forth."

58. For an *Improvement in Refrigerators*; Ephraim Larrabee, Baltimore, Maryland, February 26.

The patentee says,—"The nature of my invention consists in the arrangement and combination with each other of the water space between the double metallic linings of the preserving chamber, the ice box placed above the preserving chamber, the tube for carrying off the surplus water from the water space, and admitting fresh and cold air to the ice box, and the ventilating tubes for causing a circulation of air between the preserving chamber and the ice box, substantially in the manner described, by means of which the preserving chamber will be kept at a sufficiently low temperature, and the air contained therein be kept pure."

Claim.—"What I claim as my invention, is the inclosing water space for cooling the preserving chamber, in combination with the pipe for discharging the waste water, substantially in the manner described."

59. For an *Improvement in Sca'le Beams*; Samuel T. McDougall, City of New York, February 26.

The patentee says,—"The nature of my improvement consists in a combination of two or more scale beams or steelyards, in order that on one of them the weight in units and tens may be indicated, on another the hundreds, and on a third, if necessary, the thousands."

Claim.—"What I claim as my invention, is the combination of two or more scale beams (having fixed and independent points of suspension) with each other at the points where the weight is usually attached, substantially in the manner and for the purpose set forth."

60. For an *Improvement in Meat Cutting Apparatus*; John G. Perry, South Kingston, Washington county, Rhode Island, February 26.

The patentee says,—"The nature of my invention consists in providing a series of radia-

ting curved knives in a stationary block, and a series of studs, also radiating in a rotating block, and combining the two said blocks together to make the studs act as rakes, to revolve and press the meat, &c., against the knives, to mince the meat, &c., in the manner more clearly explained hereafter."

Claim.—"I claim the studs placed on the bar, in combination with the openings to direct the minced meat, &c., into the said openings: that is, directing the said minced matters into either one of the openings every revolution of the block, to prevent the minced meat, &c., from undergoing re-mincing, as set forth."

61. For an *Improvement in Distilling Oleaginous Matter*; Anthony M. Poisat and David C. Knab, Paris, France, February 26.

The patentees say,—"Our invention consists, 1st, in combining with a boiler for the distillation of fatty or oleaginous substances a self-feeding apparatus, that the substance to be distilled may be continuously supplied as the distillation proceeds, to avoid the necessity either of repeated re-chargings, and the loss consequent thereon, or to avoid the exposure of the substances too long to the high temperature necessary to the distillation, which has the effect to partly decompose such substances.

"2d, In the distillation of fatty or oleaginous substances in a boiler or boilers, the introduction of jets of steam at or near the bottom of the boiler, to induce the circulation of the substances under treatment, and thereby to carry off more rapidly the volatilized parts, and at the same time to prevent the admission of atmospheric air to the substances under treatment, the introduction of such jets of steam being supposed to have a beneficial chemical effect, although we have not been able to determine this.

"And the last part of our invention consists in using, in combination with an apparatus for the distillation of fatty or oleaginous substances, a lead bath at or near the melting point, interposed between the fire and boiler, to indicate the proper temperature for the distillation of such substances, and at the same time to diffuse and equalize the temperature and prevent any part from being more highly heated than others, and also to prevent any sudden and injurious transition of temperature."

Claim.—"What we claim as our invention, is facilitating and improving the distillation of fatty and oleaginous substances by the introduction of steam at or near the bottom of the boiler containing such substance, substantially as herein described, in combination with the application of external heat as described.

"And we also claim the process, substantially as described, of distilling fatty and oleaginous substances by means of a bath of melted lead, or any alloy which will melt at the same temperature, substantially as and for the purpose described, whereby we are enabled to effect the distillation at the lowest possible temperature, and have a practical indication of such temperature, as described."

62. For a *Method of Giving a Rotary Motion to Metal in Casting Chilled Rolls*; John C. Parry, Pittsburg, Pennsylvania, February 26.

The patentee says,—"My invention consists in the insertion into the mould in which a roller is cast, of a small cylinder of iron or other metal of a peculiar shape hereinafter described, which is attached to a rod, and placed in such a position inside of the mould, and fronting the mouth of the gate through which the melted metal enters the mould, that the melted metal, after leaving the gate and when it has entered the mould, is diverted from the straight direction with which it entered, and being unable, by the position of the small cylinder with a wing attached to it, (which I shall call a wing-dam,) from running otherwise in the mould than in a circular direction around its circumference, it receives a strong circular motion, which continues until the process of casting is finished."

Claim.—"I claim as my invention the use of the dam attached to the rod placed inside the mould, in chilled rollers and similar castings, as hereinbefore described, for the purpose of producing a circular motion in the melted metal."

63. For a *Parallelogram Steering Apparatus*; Jesse Reed, Marshfield, Plymouth county, Massachusetts, February 26.

The patentee says,—"My improvement consists in connecting the screw shaft with the rudder post by an arrangement of arms in the form of a parallelogram, and properly jointed to each other, so that the strain in turning the rudder is always in the line of the axis of the shaft, or parallel thereto, and the lateral strain of a heavy sea, &c., is brought near the gudgeon of the shaft, which renders it less liable to breakage, &c."

Claim.—"What I claim as my invention, is a steering apparatus in which the operating screw and nut are connected to, and turn, the rudder post, by means of a series of parallel arms and cross bars, arranged and combined together in the form of a parallelogram, and jointed together so as to turn freely, substantially as described."

64. For an *Improvement in Stoves*; Peter Sweney, Buffalo, New York, February 26.

The patentee says,—"The nature of my invention consists in dividing the interior of the upper part of the stove into three flues by means of partitions made of cast iron. Also, in introducing a current of atmospheric air into the stove at the lower extremity of the flue W, by means of a funnel-shaped pipe, so that a union is formed between the oxygen of the atmosphere and the hydrogen in the smoke, and combustion is produced by the heat radiating from the partition between the flues, which becomes heated to a temperature of about 1000° Fahrenheit by the action of an ordinary fire thereon."

Claim.—"What I claim as my invention, is the arrangement of the flues W, C, and A, in combination with the funnel-shaped air pipe, in such manner that a union will be formed between the oxygen of the atmosphere and the hydrogen of the smoke at the lower extremity of the flue W, where the heat caused by the action of the fire on the partition between the flue W and the flue C, and radiating from it, will produce combustion of those gases as they ascend through the flue W."

65. For an *Improved Hydrolator*; Zuriel Swope, Lancaster, Lancaster county, Pennsylvania; February 26.

The patentee says,—"The nature and object of my invention is to first elevate and then to carry water or materials for a distance upon a single or double cord or wire."

Claim.—"What I claim as new, is the combining with a hydrolator, for first elevating water or other substance and then conveying the same to a distance, a double acting drum, constructed substantially as described, in such a manner that the vertical raising and lowering movement of the bucket, or its equivalent, may be at a slow movement and an accelerated leverage, and the horizontal or inclined converging movement may be at an accelerated speed and a diminished leverage."

66. For an *Improvement in Apparatus for Making Coffee*; Nathaniel Waterman, Suffolk county, Mass, February 26.

The patentee says,—"The nature of my invention consists in combining with the coffee-holder, which, when in use, is placed within the interior of the decoction pot, what I term a spring expander, the object or purpose of the same being to preserve the coffee, when wet, in a close body, and at the same time to afford to it room to expand, without the production of such a condensation of it as would tend to injuriously prevent the flowage or percolation of the water through. Besides this, my invention prevents to a very great degree, if not entirely, the finer particles of the coffee from either being separated from the rest and diffused into the decoction, or settling on the strainer so as to clog the holes thereof, and impede the passage of the fluid or extract through the same."

Claim.—"What therefore I claim as my invention, is the spring expander, in combination with the coffee box or receptacle, the same being for the object or purpose substantially as specified."

67. For *Improvements in Machinery for Spinning Yarn and Making Rope*; Jesse Carpenter, Hartford, Connecticut, assignee of Cullen Whipple, Providence, Rhode Island, February 26.

The patentee says,—"My invention consists in a machine for the manufacture of cordage, which is also applicable to the manufacture of all kinds of materials from vegetable fibres which require to be formed into twisted threads or yarns; and the novelty of my machine consists in the peculiar manner of laying the said fibres, and the twisting of them, whereby each and every fibre composing any cord is made to bear its exact proportion of strain to resist fracture under tension.

"A second feature of my machine is the method of giving a double twist, first of all, to the strand itself, and secondly to the rope while laying the strands."

Claim.—"What I claim as my invention, is, 1st, giving to the strand, during the operation of spinning, a double twist to each revolution of the rings or flyers, in the manner described herein, the same being applicable to, and claimed in, the spinning of yarns from any fibrous material, and also in laying the strand into rope in the manner set forth.

"2d, I claim the combination of the weights with the bobbin stands, for the purpose of preventing those from being carried around with the rings or flyers; the whole being arranged and operated substantially in the manner and for the purpose described."

RE-ISSUES FOR FEBRUARY, 1850.

1. For an *Improvement in Curry Combs*; Wm. Beach, Philadelphia, Pennsylvania; patented March 13, 1849, re-issued February 12, 1850.

Claim.—"What I claim as new, is combining the trough-shaped bars, which have the comb-teeth on their edges, with the folded strips of metal, and with the wires running through them, in the manner substantially as herein set forth, so as to form a curry comb with open or hollow back.

"I also claim the shank constructed with the fastening hole therein, made without drilling or welding, and combined with the comb as described, so as to act as guards to the ends thereof."

2. For an *Improvement in Distilling Apparatus*; Charles A. Krechler, Stockholm, Sweden; patented July 10, 1849, re-issued February 26, 1850.

The patentee says,—“My invention consists in a rectifier of peculiar construction and arrangement, through which the vapor from the boiler is passed in its way to the condenser.”

Claim.—"What I claim as my invention, is the peculiar construction and arrangement of the rectifier as set forth: that is to say, 1st, constructing the rectifying chambers and water cases with charging hole, substantially as set forth, by which means the various substances employed to rectify or to flavor the spirit, can be easily charged into, or discharged from, any one chamber, without dismounting the apparatus or removing the substances in the other chambers.

"2d, The particular form of the rectifying chambers, which are made of the frustra of two cones united at their bases, the upper forming the condensing surface of the aqueous vapor."

3. For a *Method of Attaching a Ball to a Cartridge*; William R. Palmer, assignee of Walter Hunt, City of New York; patented August 10, 1848, re-issued Feb. 26, 1850.

The patentee says,—“The nature of my invention consists in making the cartridge of a cylindrical form, of wood or other equivalent substance, bored out or otherwise formed, with the rear end closed except a central hole for the ignition of the charge by the priming, when this is combined with, and attached to, the rear end of a ball by inserting one into the other.”

Claim.—"What I claim as my invention, is the method substantially as herein described, of attaching or joining to a ball a cartridge made of wood or other equivalent material, in manner substantially as described."

4. For a *Loaded Ball*; George A. Arrowsmith, assignee of Walter Hunt, City of New York; patented August 10, 1848, re-issued February 26, 1850.

The patentee says,—“The nature of my invention consists in making balls of metal for fire arms with the rear part thereof cylindrical, and with a cavity of sufficient capacity to receive the entire charge of gunpowder, which is therein confined by a cap or the equivalent thereof, having a central hole through which the charge is inflamed.”

Claim.—"What I claim as my invention, is making metallic balls for fire arms with the rear part thereof cylindrical and a cavity in the said cylindrical part of a sufficient capacity to receive the entire charge of gunpowder, substantially as herein described, when the said charge is retained in the ball by a cap or the equivalent thereof, having a central hole through which the charge can be inflamed, substantially as described."

DESIGNS FOR FEBRUARY, 1850.

1. For a *Design for Stoves*; Peter J. Simmons, Troy, New York, February 5.

The patentee says,—“The distinguishing features consist in the form of the cornice, moulding of the bottom plate, and other mouldings and ornaments as represented.”

Claim.—"What I claim is the design and configuration of a cook stove, substantially the same as described."

2. For a *Design for Cooking Stoves*; William C. Davis, assignee of Joseph G. Lamb and Conrad Harris, Cincinnati, Ohio, February 5.

Claim.—"What we claim as our invention, is the combination and arrangement of the panelings, ornaments, mouldings, &c., into an ornamental design for cooking stoves, when constructed, combined, and arranged substantially as represented."

3. For a *Design for Stoves*; William P. Cresson, assignee of Wm. P. Cresson, David Stuart, and Peter Seibert, Philadelphia, Pennsylvania, February 5; anté dated October 1, 1849.

Claim.—"We claim the ornamental design for a stove called the Cottage Parlor Air Tight, as described."

4. For a *Design for Stoves*; William P. Cresson, assignee of Stuart, Cresson & Seibert, Philadelphia, Pennsylvania, February 5; anté dated October 1, 1849.

Claim.—"We claim the ornamental design for a stove called a Radiator Screen, as described."

5. For a *Design for Stoves*; Samuel D. Vose, Albany, New York, February 12; anté dated November 17, 1849.

Claim.—"What I claim is the combination and arrangement of ornamental figures forming respectively the front and side plates of my stove, as described."

6. For a *Design for Stoves*; Samuel D. Vose, Albany, New York, February 12; anté dated November 17, 1849.

Claim.—"What I claim is the combination and arrangement of ornamental figures forming respectively the outside plates of my parlor stove, as described."

7. For a *Design for Stoves*; Samuel D. Vose, Albany, New York, February 12; anté dated November 17, 1849.

Claim.—"What I claim is the combination and arrangement of ornamental figures forming respectively the front, top, and side plates of my stove, as described."

8. For a *Design for Stoves*; S. B. Sexton & Co., Baltimore, Maryland, assignees of James H. Conklin, Peekskill, Westchester county, New York, February 19.

Claim.—"What I claim is the production of the new design for stoves, as described."

9. For a *Design for Stoves*; Jeremiah D. Green and George Warren, Troy, New York, February 19.

Claim.—"What we claim is the configuration and arrangement of the ornamental figures on the door panels and feet of the stove, constituting together a design for a stove."

10. For a *Design for Stoves*; Lathrop S. Bacon, Rochester, New York, February 26.

Claim.—"What I claim is the peculiar form, shape, or configuration of the said stove plate, to be used as the front oven plate to an elevated oven; such shape, form, or configuration being a design independent of any particular ornaments."

11. For a *Design for Stoves*; Clute & Brothers, Schenectady, assignees of William L. Sanderson, Troy, New York, February 26.

Claim.—"What I claim is the design and configuration of ornaments constituting a parlor stove, substantially the same as described."

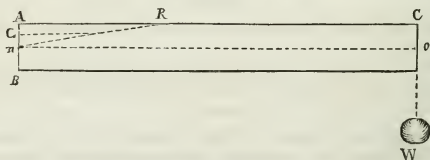
MECHANICS, PHYSICS, AND CHEMISTRY.

Formula for the Strain upon Timber.—Centre of Gravity of an Ungula and Semi-Cylinder. By HERMAN HAUPT, Esq., Civ. Eng.

To the Editor of the Journal of the Franklin Institute.

Dear Sir: About twelve years ago I became very much interested in calculations upon the strength of materials, but my location at that time (as engineer on a small railroad in the interior of the State) not affording me facilities for consulting any of the standard writers whose works might have thrown light upon the subject, I had recourse to experiment and observation, in order to satisfy myself in reference to the mode of distribution of the strains, and to determine the formulæ for calculating their intensities. A little reflection led to the application of a principle which appears to be different from any that has been employed by others for the determination of the ordinary algebraic expressions which represent the strength of different forms of beams, and appears so simple and easy of application, and at the same time so readily deduced from the elementary conditions of resistance, that I will take the liberty of troubling you with a brief explanation of the principle itself, and its application to some of the ordinary cases which occur in practice.

The first fact which has been established in the resistance of beams laid horizontally upon two supports, or fixed at one end and loaded with a weight applied at the other, is, that the fibres on one side are compressed and on the other side extended. It is also a consequence of the elasticity of the material that, within the elastic limits, the resistances to extension and compression must be sensibly equal, and that a certain line exists called the neutral axis, along which neither extension nor compression will be found, and which retains its natural condition. It is also evident that, in a material which is perfectly homogeneous, the strains upon the fibres will vary uniformly from the neutral axis to the most distant fibres. These conditions naturally lead to the following mode of calculation:



Let AC represent a beam fixed at A and loaded with a weight W applied at C, *n o* represents the neutral axis. The fibres on the side *n A* will be extended, and those on the side *n B* will be compressed, and their resistance must be sufficient to keep in equilibrium the weight W.

If ABC represents a section of the beam by a vertical plane, we may conceive the strain upon the fibre AC, or its equivalent resistance, to be represented by some line AR; and as the strain at *n* is nothing, and is supposed to vary uniformly from *n* to A, it follows that if *n* and R be joined,

forming a triangle, the strain upon any intermediate fibre will be represented by the corresponding perpendicular of this triangle, and the whole strain, equal to the sum of all the perpendiculars, by the area of the triangle. The effect of this triangle of resistance would be equivalent to its whole area concentrated at its centre of gravity, and acting with a leverage equal to the distance of this point from the neutral axis.

This principle furnished a key to the solution of all the problems which are presented in calculations upon the strength of materials; it was found to be susceptible of general application. Some of the solutions require the aid of calculus, but in general they are extremely simple. The case of a rectangular beam fixed at the end will serve as an illustration.

Let the maximum strain upon the fibre AC be represented by R. Also,

b = breadth of beam in inches.

d = depth of beam in inches.

l = length in inches.

W = weight applied at C.

The area of the triangle $ARn = \frac{Rd}{4}$. The distance $Gn = \frac{1}{3}d$. The effect of the triangle of resistance will be $\frac{Rd}{4} \times \frac{d}{3} = \frac{Rd^2}{12}$. The resistance of the fibres nB will be also equal to $\frac{Rd^2}{12}$, and the whole resistance will be $\frac{Rd^2}{6}$. The effect of the weight W , acting with a leverage l , will be Wl , and the equation of equilibrium will be $\frac{Rd^2}{6} = Wl$.

In this expression the breadth of the beam has not been introduced, the calculations having been made upon a vertical section; but if the breadth be considered, the triangle becomes a wedge, and the centre of gravity remaining at the same distance as before, the only change in the expression results from the introduction of this term, and it becomes—

$$\frac{Rbd^2}{6} = Wl, \text{ or } R = \frac{6Wl}{bd^2},$$

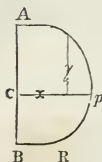
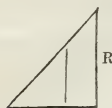
An expression which is identical with those obtained by Tredgold and others by different processes.

If the beam should be placed in such a position that the diagonal of the cross section would be vertical, the solid which would represent the resistance would become a triangular pyramid, instead of a wedge as in the case just considered.

If the resisting material should be in the form of a cylinder, the case would present greater difficulty, but is susceptible of solution on precisely the same principle, the solid of resistance in this case being an ungula.

As some difficulty was experienced in the solution of this problem, in consequence of my inability to find a demonstration of the manner of determining the centre of gravity of this solid, I will give the process by which I calculated its position. I do not know whether it has been previously ascertained or not, no doubt it has, but it is not to be found in my own or any library to which I have had access.

To find the volume and the position of the centre of gravity of an ungula or solid formed by passing an oblique plane through the diameter of the base of a semi-cylinder.



All the sections parallel to A B will be rectangles, the altitudes of which will be proportional to their distance from C. Hence if R represent the altitude at p, and x = the distance to any section, r = radius, y = ordinate,

$$r : x :: R : \frac{R x}{r} = \text{the perpendicular of rect-}$$

angle, and $\frac{R}{r} x y$ = area. The elementary solid

will be $\frac{R}{r} x y d x$, and its moment = $\frac{R}{r} x^2 y d x$.

The distance to the centre of gravity will be

$$\frac{\int_r^0 x^2 y d x}{\int_r^0 x y d x}.$$

1. To determine the volume of the ungula, we have $y = \sqrt{r^2 - x^2}$;

$$\text{Hence, } \int x y d x = \int (r^2 - x^2)^{\frac{1}{2}} x d x.$$

$$\text{Make } r^2 - x^2 = z^2,$$

$$\text{Whence } x d x = -z d z.$$

$$\int (r^2 - x^2)^{\frac{1}{2}} x d x = -\int z^2 d z = -\frac{z^3}{3} = \frac{-(r^2 - x^2)^{\frac{3}{2}}}{3},$$

which becomes, when taken between the limits 0 and r , $-\frac{r^3}{3}$. This negative result does not affect the absolute volume; to interpret it it must be observed that the integral does not become 0 when $x = 0$, but when $x = r$, and consequently the solid lying in the direction of C from p should be negative. $\frac{R}{r} \cdot \frac{r^3}{3} = \frac{R r^2}{3}$. The volume of the ungula is, therefore, equal to that of a pyramid whose base is the circumscribing rectangle with the same altitude.

$$2. \int x^2 y d x = \int (r^2 - x^2)^{\frac{1}{2}} x^2 d x = \int \frac{x}{2} (r^2 - x^2)^{\frac{1}{2}} 2 x d x.$$

Integrate by parts making in the formulæ

$$\int z d y = z y - \int y d z \quad z = \frac{x}{3}, y = (r^2 - x^2)^{\frac{3}{2}},$$

$$\text{Whence } d y = \frac{3}{2} (r^2 - z^2) 2 z d z.$$

Substitute these values we obtain

$$\int \frac{x}{2} (r^2 - x^2)^{\frac{1}{2}} 2x dx = -(r^2 - x^2)^{\frac{3}{2}} \frac{x}{3} + \frac{1}{3} \int (r^2 - x^2)^{\frac{3}{2}} dx.$$

The quantity $(r^2 - x^2)^{\frac{3}{2}} \frac{x}{3}$ will reduce to 0 when $x = 0$ or $x = r$; this term will therefore disappear, and the expression reduces to

$$\int x^2 (r^2 - x^2)^{\frac{1}{2}} dx = \frac{1}{3} \int (r^2 - x^2)^{\frac{3}{2}} dx = \frac{1}{3} \int (r^2 - x^2)^{\frac{1}{2}} (r^2 - x^2) dx = \\ \frac{1}{3} \int (r^2 - x^2)^{\frac{1}{2}} r^2 dx - \frac{1}{3} \int (r^2 - x^2)^{\frac{1}{2}} x^2 dx.$$

Transpose the last term to the first member and reduce

$$\int (r^2 - x^2)^{\frac{1}{2}} x^2 dx = \frac{1}{4} (r^2 - x^2)^{\frac{1}{2}} r^2 dx.$$

But the integral $\int (r^2 - x^2)^{\frac{1}{2}} dx$, between the limits 0 and r , represents the area of a quadrant $= \frac{1}{4} \pi r^2$.

$$\text{Hence } \int (r^2 - x^2)^{\frac{1}{2}} x^2 dx = \frac{1}{4} r^2 \left(\frac{\pi r^2}{4} \right) = \frac{\pi r^4}{16},$$

$$\text{And } \frac{\int_r^0 (r^2 - x^2)^{\frac{1}{2}} x^2 dx}{\int_r^0 (r^2 - x^2)^{\frac{1}{2}} x dx} = \frac{\frac{\pi r^4}{16}}{\frac{r^3}{3}} = \frac{3}{16} \pi r =$$

distance from the centre of the circle to the perpendicular through the centre of gravity. The line which joins C and the middle point of R, passes through the centres of all the elementary rectangles, and therefore the centre of gravity must be found at the intersection of this line with the perpendicular, through a point at a distance of $\frac{3}{16} \pi r$ from the centre. Its distance from the base is, therefore, the fourth term of the proportion $r : \frac{3}{16} \pi r :: R : \frac{3}{16} \pi R$. The substitution of this value in the general formula will give, for the resistance of a cylinder laid horizontally, the same results that have been obtained by other processes. The subject will be concluded with one more problem similar to the preceding, which is also useful in the determination of the formulæ for the resistance of solids.

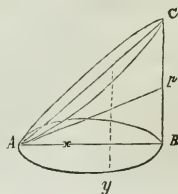
To find the volume and centre of gravity of a semi-cylinder, cut off by an oblique plane passing through the edge of the base.

Let r = radius, x = any abscissa, y = the corresponding ordinate of the circle.

Then $2r : x :: R : \frac{R}{2r} x$ = perpendicular of elementary rectangle.

$$\frac{R}{2r} x \cdot 2y = \text{area} = \frac{R}{r} xy. \quad \frac{R}{r} xy dx =$$

elementary solid. $\frac{R}{r} y x^2 dx$ = moment of elementary rectangle.



But from the equation of the circle we have $y = \sqrt{2rx - x^2}$.

$$\int \frac{R}{r} xy dx = \frac{R}{r} \int (2rx - x^2)^{\frac{1}{2}} x dx.$$

Make $(r - x) = z$, $dx = -dz$, $2rx - x^2 = r^2 - z^2$.

Substitute these values we obtain

$$\begin{aligned} \frac{R}{r} \int (2rx - x^2)^{\frac{1}{2}} x dx &= \frac{R}{r} \int (r^2 - z^2)^{\frac{1}{2}} (r - z) (-dz) = \\ &= -\frac{R}{r} \left[\int (r^2 - z^2)^{\frac{1}{2}} r dz + \int (r^2 - z^2)^{\frac{1}{2}} z dz \right] \end{aligned}$$

The first of these integrals, taken between the limits $+r$ and $-r$, is the area of a semicircle, and is consequently equal to $\frac{\pi r^2}{2}$; hence the value of the first term becomes $\frac{\pi r^3}{2}$.

The second term becomes $\frac{(r^2 - z^2)^{\frac{3}{2}}}{3}$, (see demonstration of ungula,) and is equal to 0 when $z = +r$, or $z = -r$. It therefore disappears, and the volume of the solid becomes $-\frac{R}{r} \cdot \frac{\pi r^3}{2} = -\frac{1}{2} \pi r^2 R$, a result which is evidently correct, since the volume is half that of the cylinder, $\pi r^2 R$.

To find the distance to the centre of gravity, we must divide the integral of $\frac{R}{r} y x^2 dx$ by the volume. Making similar substitutions to those used

in finding the volume, we obtain $\frac{R}{r} \int y x^2 dx =$

$$\begin{aligned} \frac{R}{r} \int (r^2 - z^2)^{\frac{1}{2}} (r - z)^2 (-dz) &= \frac{R}{r} \int (r^2 - z^2)^{\frac{1}{2}} (r^2 - 2rz + z^2) (-dz) = \\ &= -\frac{R}{r} \left[r^2 \int (r^2 - z^2)^{\frac{1}{2}} dz - 2r \int (r^2 - z^2)^{\frac{1}{2}} z dz + \int (r^2 - z^2)^{\frac{1}{2}} z^2 dz \right] \end{aligned}$$

The first of these integrals is a semicircle, hence $r^2 \int (r^2 - z^2)^{\frac{1}{2}} dz =$
 $v^2 \frac{\pi r^2}{2} = \frac{\pi r^4}{2}$.

The second, $\int (r^2 - z^2)^{\frac{1}{2}} z dz$, as we have seen, becomes = 0.

The third, $\int (r^2 - z^2)^{\frac{1}{2}} z^2 dz$, was found in the problem of the ungula to be $\frac{1}{4} r^2 \int (r^2 - z^2)^{\frac{1}{2}} dz$, which, between the limits $+r$ and $-r$, becomes $\frac{\pi r^4}{8}$.

The whole expression therefore becomes

$$\frac{R}{r} \int y x^2 dx = -\frac{R}{r} \left(\frac{\pi r^4}{2} + \frac{\pi r^4}{8} \right) = -\frac{5}{8} \pi R r^3,$$

$$\text{And } \frac{\frac{R}{r} \int y x^2 dx}{\frac{R}{r} \int y x dx} = \frac{-\frac{5}{8} \pi R r^3}{-\frac{1}{2} \pi R r^2} = \frac{5}{4} r.$$

Hence the line through the centre of gravity, perpendicular to the base, passes at a distance of $\frac{1}{4} r$ from the centre. The centre of gravity will be found in this line, and also in the line drawn from A to the middle point of B C. Hence it will be at their intersection, and its height above the base can be found by the proportion $2r : \frac{R}{2} :: \frac{5}{4} r : \frac{5}{16} R$.

HARRISBURG, April 29, 1850.

For the Journal of the Franklin Institute.

Notice of a Meteor.

A meteor of uncommon brilliancy was seen on the night of the 11th of May, at 18 minutes past 11 o'clock. Its path appeared to be nearly parallel to the plane of the ecliptic. When first observed it was in proximity with β Virginis, and it disappeared behind a building when close to Regulus; the part of its course seen having been about 2° of arc, and the time occupied, as near as could be judged, $1\frac{1}{2}''$. Its brilliancy was much greater than that of Jupiter, which was in the vicinity. Its shape was that of a globe whose diameter was about three times the apparent diameter of Jupiter, followed by a trail of a length about equal to the diameter of the globe. The general color was a brilliant white, shaded with green and red at the margin and extremity of the tail. J. C. C.

For the Journal of the Franklin Institute.

Atlantic Steam Navigation.

"WHEN GREEK MEETS GREEK, THEN COMES THE TUG OF WAR."

The present time is particularly interesting to all who feel an interest in American Steam Navigation. The "Atlantic" has made her first passage to Liverpool, and although retarded for about 36 hours by accidents, has still made respectable time. It is a great misfortune that all our steamers are hurried off before being fully tried; they are advertised two or three months in advance, and are started off at the exact time, finished or not, and that important maxim of the late Col. Crocket, "Be sure you're right, then go ahead," is entirely forgotten; and, although everything is at stake, the reputation both of builders and vessel is often sacrificed for want of a complete and thorough trial. The fact that as builders of marine engines we are young, is entirely overlooked, and with the confidence of youth we

assume positions which on trial fail, and we again press on to some other point, and are again deceived.

All must remember with what a flourish of trumpets the steamers "Washington" and "United States" were heralded forth, and yet those vessels never possessed powers superior to the Cunard line,—never came up to them; and for those steamers to have made quicker trips across the Atlantic, it would have been necessary for them to have procured a dispensation of the known laws of Nature in their especial favor. No reasonable man, free from prejudice, could, at any time before or after their completion, demonstrate that they ought to beat the Cunard line, and the hopes that were excited, and the money that was lost, were all owing to the fact that passion assumed the reins and reason was left out of the case entirely. We forget that the opponents against whom we contend are not men but machines,—that the elements they operate with will do as much for them as for us. They use the same coal and water, have the same fair and head winds, plough the same ocean, and run the same distance. We have always overestimated ourselves and underrated our opponents.

With the formation of the Collins line of steamers reason returned, and although they may not have fully considered all the points in the case, (and I think they have not,) still I believe they earnestly desired to do so, and in building their present ships, the "Atlantic" and "Pacific," they have availed themselves of the experience of the past and the reason of the present, and have put on the ocean two steamers of great beauty of model and matchless strength. The exquisite taste displayed in their cabins, and in all the internal arrangements which conduce so much to the comfort and happiness of those on board, is not to be surpassed. With machinery of great power, and with boilers of great economy, success may be considered certain, and I fully believe that the reasonable expectations of those interested will be gratified; but when these vessels were designed the fastest steamers of the Cunard line were the "Niagara," "Europa," "Canada," and "America;" to surpass these was all that at that time was considered, but since their commencement, and after all their proportions were settled, two steamers, the "Asia" and "Africa," are commenced on the opposite side, and one of these vessels is now ready for sea; and it will therefore be seen that, supposing them to be victors over the field as it exists to-day, one month will bring into action new opponents of larger size and greater power than those before in use, and what might have been a settled question in the minds of many now becomes doubtful to those who think and reflect for themselves, and it is to this point that I wish to draw attention.

The "Atlantic" and "Pacific" are 290 feet on deck, 46 feet beam, and 32 feet hold; have each two engines of 95 inches diameter of cylinder and 9 feet stroke. The "Asia" and "Africa" are reported 500 tons less in size,—are shorter, narrower, and of less depth. I have not their exact dimensions, but they are no doubt at least 500 tons smaller, and have each two engines with cylinders 96 inches diameter and 9 feet stroke;—with less size they have greater power. Now if we suppose that each are equal as regards model and consumption of fuel, the smaller vessel having the least resistance must be the fastest. But I will assume that the Collins vessel have finer models below water, and will burn less fuel and conse-

quently carry less coal; if so, then the difference of power may be compensated by these advantages in fair weather. But while in fair weather the increased size of the ship, which is principally above water, gives but little resistance, in head winds the sum of all the resistance is what we have to contend with, and such being the fact, I can see no reason why the "Atlantic" and "Pacific" should beat the "Asia" and "Africa," but, on the contrary, I fear the reverse. I should rejoice to have it otherwise, for as sure as the course of empire tends to the West, so surely will we eventually triumph. My position then is, that, while it is possible for the "Atlantic" and "Pacific" to equal or even to excel the "Asia" and "Africa" in fair weather, with head winds the latter will excel. FULTON.

For the Journal of the Franklin Institute.

A New Method of Determining Uranium in its Ores. By AD. PATERA.
Communicated by THEO. F. MOSS, Mining Engineer.

A weighed quantity of the ore is dissolved in nitric acid, filtered from the residuum, and then saturated with an excess of carbonate of potash, whereby the uranium remains in solution as neutral uranate of potash, with arsenic and sulphuric acids when these are present. All the other metals in combination are precipitated as carbonates and separated by filtering. The soluble neutral uranate of potash is then boiled in a gilt silver vessel, whereby acid uranate of potash is formed, which is insoluble in water and is easily washed, and from which the quantity of uranium can easily be determined. This method is capable of technical application.

For the Journal of the Franklin Institute.

A Trip around Cape Horn by the Steamer "Tennessee."

The steamer "Tennessee," formerly running from New York to Savannah, was purchased last fall by Howland & Aspinwall for their Pacific line. She left New York deeply loaded with coal on the 6th of December last, crossed the Equator on December 23d, at 12 o'clock, and arrived at Rio de Janeiro on the 31st,—time from port to port 25 days; was detained in port 14 days taking in coal and stores. Left Rio on the 14th of January, for Valparaiso via the Straits of Magellan; on the 21st was visited by a violent gale of wind which lasted for two days, during which time but 42 miles headway was made. On the 27th made the white cliffs of Cape Virgius, and the shoal called the Bank of Sanniento, where the tide rises 36 feet; put to sea that evening and returned next morning and entered Possession Bay, and anchored 30 miles up. While here another severe gale came on, and the engine was worked slowly ahead to relieve the anchor. On the 31st weighed anchor and proceeded 20 miles further up the Bay. On weighing anchor the windlass gave way, and the ship was detained until February 3d, when she started for the Straits. On the passage through, the steamer lost several days at Borja Bay, where she anchored on account of the stormy weather. Left there on February 9th,

and arrived at Valparaiso on the 16th, where she remained 10 days; left on the 26th, and arrived at Panama on the 12th of March.

The "Tennessee" is about 200 feet long, 35 feet beam, and $21\frac{1}{2}$ feet hold. One side lever engine, with cylinder 75 inches diameter and 8 feet stroke; water wheel 32 feet diameter and $7\frac{1}{2}$ feet face. Number of revolutions from New York to Rio 443,931, and from Rio to Valparaiso 320,251. Machinery built by Stillman, Allen & Co., Novelty Works, New York.

B.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, May 17th, 1850.

Samuel V. Merrick, President, in the chair.

Thomas Fletcher, Vice President.

Isaac B. Garrigues, Recording Secretary.

John F. Frazer, Treasurer.

The minutes of the last meeting were read and approved.

A letter was read from The Royal Geographical Society, London.

Donations were received from The Royal Geographical Society, and The Chemical Society, London; Charles F. Looney, Esq., Vienna; Hon. A. C. Green, U. S. Senate; Hon. Joseph R. Chandler, U. S. Congress; Hon. W. Jackson, Boston, Mass.; Thos. H. Forsyth, Esq., Pennsylvania Senate; Chas. E. Smith, Esq., Thos. U. Walter, Esq., Philadelphia.

The periodicals received in exchange for the Journal of the Institute were laid on the table.

The Treasurer read his statement of receipts and payments for the month of April.

The Board of Managers and the Standing Committees reported their minutes.

The Board of Managers reported that they had elected V. De Amarelli, P. D., LL. D., of Rossena, Professor of Literature in the Royal Lyceum of Naples, a corresponding member of the Institute.

Prof. Frazer read the report of a Special Committee appointed by the Board of Managers, on the subject of Mrs. Sarah Peter's proposition for a School of Design for young women, referred to the Board of Managers by the Institute at their last meeting.

The Chairman of the Committee on Exhibitions reported that the Committee had instructed him to recommend the Institute to hold an Exhibition of American Manufactures next Fall.

Prof. Frazer read the report of a Sub-Committee, appointed by the Committee on Exhibitions to examine whether the goods (papier maché) exhibited by Mr. Daniel D. Dick at the last Exhibition were made and finished by him, to which was appended the following resolution, which was adopted by the Committee on Exhibitions:

Resolved, That the Committee on Exhibitions have received satisfactory evidence that the goods exhibited at the late Exhibition by Mr. Daniel D. Dick, were made by him, or by his workmen, under his direction, and they therefore award a Recall First Premium to Mr. Dick for the same.

On motion, it was

Resolved, That a Committee of Five be appointed to examine and report upon the mode in which the Franklin Institute can best forward the project of a School of Design for young women.

To which the President was added as Chairman. Committee.—Messrs. S. V. Merrick, Jno. F. Frazer, Dr. Chas. M. Wetherill, Thos. U. Walter, Fred. Fraley, D. S. Brown.

On motion, the Committee on Exhibitions were instructed to take the necessary steps to hold an Exhibition of American Manufactures next Fall, agreeably to their recommendation this evening.

New candidates for membership in the Institute (7) were proposed, and those proposed at the last meeting (4) were elected members of the Institute.

Prof. Frazer read to the meeting a letter from Prof. F. A. Wylie, of the University of Indiana, announcing the discovery of gold in the vicinity of that place, and exhibited specimens of the gold, and of the black sand in which it is found.

“The gold has been found in the beds of the rivulets in Morgan county, about twenty miles north-east, in Jackson county, about twenty miles south-east, in Brown county, about twenty miles east, and in Green county, about fourteen miles west, of Bloomington, as well as at certain intermediate points, but not in the immediate vicinity. Where it has been found it is always in connexion with a black sand which the *washers* call ‘*emery*.’ This sand is found at the bottom of the streams, usually at the upper end of the sand-bars, or on the margins of the streams where there is a sudden turn, and in such places as it would be naturally deposited on account of its density. The coarse gravel is sifted and washed in the usual way until nothing remains but the dense black sand. On examining closely with the microscope, there are to be perceived interspersed through it red particles of different shades, and some few yellow and green particles; of the red particles some appear to be merely colored quartz, while others are plainly distinguished by their crystalline form as garnets, and some of the darkest probably pyrope. The black particles are readily separated into two sorts by the magnet. Those attracted by the magnet, which amount in some specimens to five per cent. of the whole, are evidently *magnetic oxide of iron*. The remaining black grains agree precisely with Dr. Thompson’s description of *Titanate of Iron* or *Menachanite*.” The gold is in flat scales, a good deal resembling in its appearance that from California.

Prof. Frazer remarked that, from the account of Prof. Wylie, it did not appear that this new gold field was likely to prove profitable in the working, but it was of great interest, both in a geological and mineralogical point of view, and gave rise to an interesting inquiry as to the original locality of the minerals associated with the gold, since they are of a nature inconsistent with the rock formations of that portion of the United States.

Mr. Smith presented Harris’ Patent Brake, designed for hoisting machines, cars, and trucks. In this invention the friction plates act on flanches at each end of the shaft, and are drawn together by twisting the rods to which they are connected, the power being applied through a series of levers.

Mr. M. T. W. Chandler remarked that he had seen a similar contrivance applied to stages at Delhi.

Mr. C. Shaw exhibited a Camp Chest, invented by Shaw & Stallcup. This chest may be converted into a table, chair, or settee, for two or three persons, single or double bed, &c. It contains a writing desk, drawers for clothing, papers, and a toilet drawer; a cook stove, summer baker, wash boiler, coffee pot, six cups, six plates, knives, forks, spoons, canisters, &c., &c. The whole is covered with tarpaulin. The entire chest of a size for two persons measures 3 feet \times 2 \times 2; if for one person, 2 feet \times 2 \times 2. The larger weighs 120 lbs., the smaller 100 lbs.

Mr. Seth E. Winslow exhibited and explained to the members present a model of his patented substitute for the pulleys and weights of windows. It consists of a spring attached to the side of a window sash, upon which a roller runs. When the window is hoisted the roller does not bear against the window frame, and hence the window may be easily raised; but when the sash tends to descend, the roller runs along the spring and is pressed against it, so as to hold the sash firmly in its place. A simple modification locks the window sashes when both in place, so as to prevent the window from being hoisted from the outside.

Mr. B. H. Bartol made some interesting remarks in relation to Pirsson's Fresh Water Condenser, now in use on board the steamer "Osprey." The peculiar feature of this condenser, which distinguishes it from all others previously known to the public, is the placing of the condensing tubes horizontally within the ordinary shower condenser, which is made of enlarged dimensions for the purpose. By this arrangement, the water required for condensation is admitted through the ordinary injection cock, and rises to the top of the external condenser, where it is discharged on a scattering-plate, from whence it passes directly on to the tubes of the internal condenser, which are below it and arranged in three ranges or sets, one above the other; the steam from the cylinder is admitted into the upper range, and passes through the three before being discharged at the bottom. The fresh water produced by the condensation of the steam is pumped out by a small pump and immediately returned to the boilers, while the water used to produce condensation is taken out by the air pump of the engine. The internal condenser is not attached to the external one, but merely laid in it. The three ranges are separately made, and the outlet from the upper slips loosely into the one below it, so that when the whole internal condenser is together, it may be moved from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. in any direction. This freedom prevents any liability to fracture from unequal expansion, and the tubes being in vacuum relieves them from all pressure. As the condensing water reaches the bottom of the tubes it is immediately pumped out, so that there is not at any time any water around the tubes other than the thin sheet passing over their surfaces. On the "Osprey," the vacuum within the tubes of the internal condenser is 26 inches, and the same in the external one; the internal vacuum is the result of condensation, while the external vacuum is produced by the air pump. The "Osprey" has made three passages, or 2750 miles in all, and has no trouble in keeping a full supply of fresh water in her boilers.

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